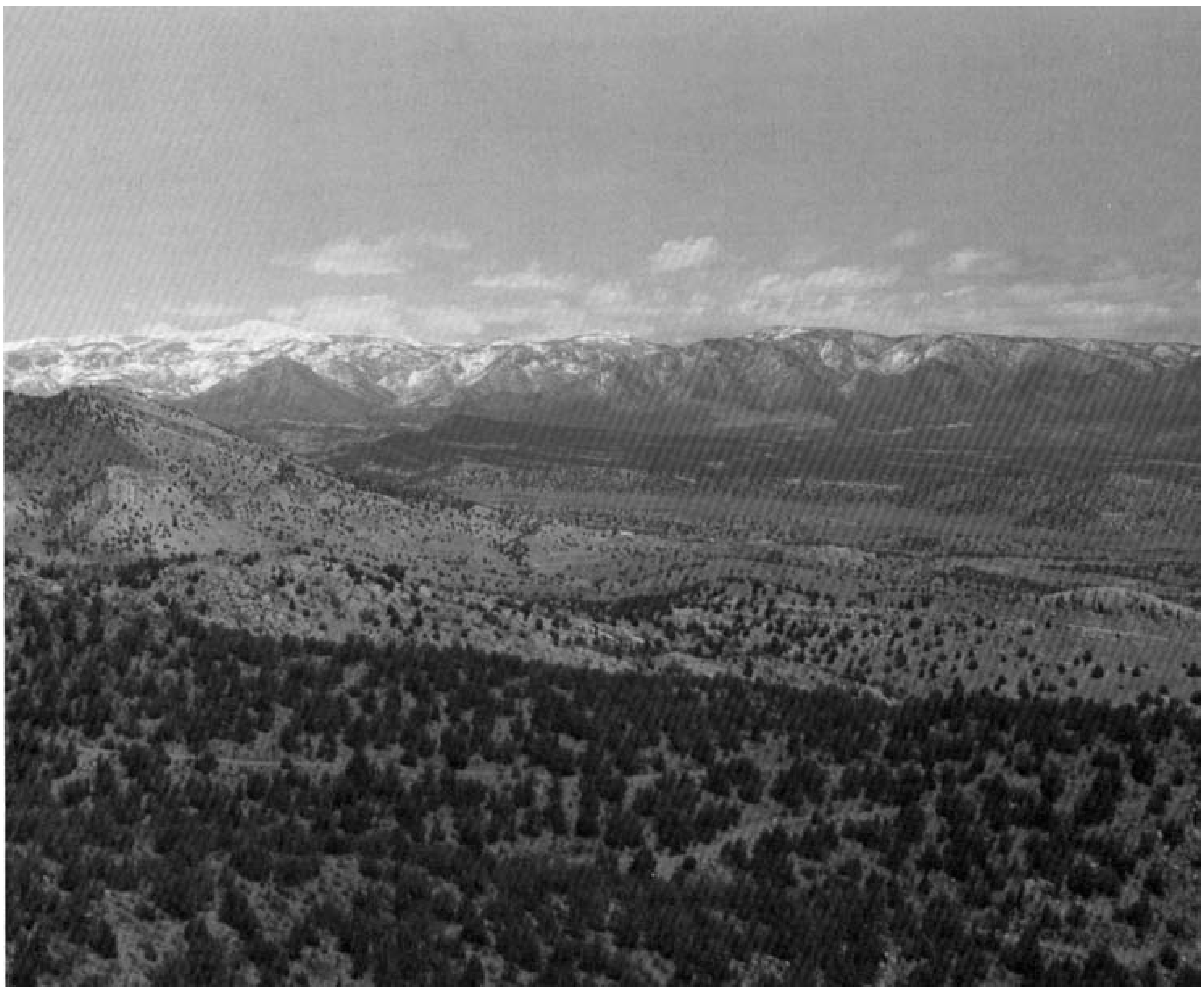
United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Colorado Agricultural
Experiment Station and
the United States
Department of the
Interior, Bureau of Land
Management

Soil Survey of Fremont County Area, Colorado



How To Use This Soil Survey

General Soil Map

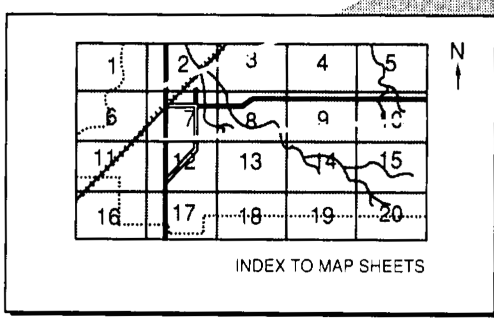
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

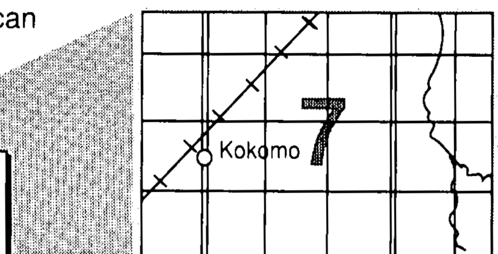
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

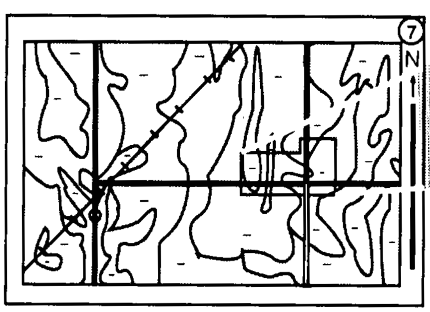
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



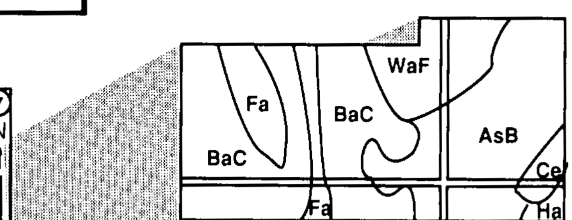


MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Natural Resources Conservation Service; the Colorado Agricultural Experiment Station; the United States Department of the Interior, Bureau of Land Management; Fremont County; and the Fremont Soil Conservation District. It is part of the technical assistance furnished to the Fremont Soil Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Pinyon and juniper woodland covers nearly one-half of the survey area. Pikes Peak, which is beyond the survey area, is in the left background.

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Issued December 1995

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in the survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Duane L. Johnson
State Conservationist
Natural Resources Conservation Service

Soil Survey of Fremont County Area, Colorado

By Timothy J. Wheeler, David L. Anderson, Saul Engel, Ann M. Hogan, Lynn S. Larsen, Lee A. Neve, and Richard R. Romano

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Colorado Agricultural Experiment Station and the United States Department of the Interior, Bureau of Land Management

The survey area includes most of Fremont County, Colorado, except for three areas in the San Isabel National Forest (fig. 1). The western two-thirds and all of the northern one-half of the survey area consist of mountains and valleys. The Arkansas River has cut deep canyons from west to east through the mountains and toward the plains. The southeastern part of the survey area is on the plains and on the foothills of the Rocky Mountains. Elevation ranges from 4,900 to 11,700 feet.

The survey area includes 873,400 acres, or about 1,365 square miles. In 1980, the total population of Fremont County was 28,676, which includes nearly all of the population in the survey area. Canon City, the county seat, had a population of 13,037 within the city limits and 20,651 including the surrounding area *(11)*.

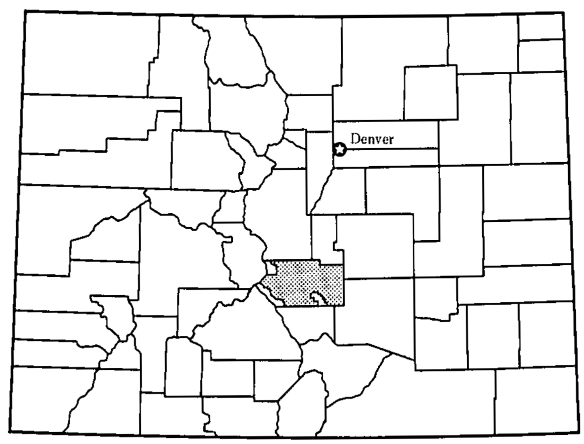

Figure 1.—Location of the Fremont County area in Colorado.

General Nature of the Survey Area

This section provides general information about the survey area. It briefly describes history, water supply, industry and recreation, agriculture, physiography and drainage, geology, and climate.

History

Europeans first explored the survey area in 1806, when Zebulon Montgomery Pike led his expedition up the Arkansas River *(7)*. Fur trappers, traders, and mountain men came to the region in about 1825 and established trading posts in the Arkansas Valley *(3)*. Between 1842 and 1853, John Fremont led five expeditions through the region, seeking feasible routes through the mountains and collecting plants and animals for scientific study *(6)*.

Canon City was settled in 1859. In its early days, the city served as a trade center and gateway to the gold and silver camps to the west. Meat, fruit, and vegetables were grown and supplied to mining districts and other markets *(3)*.

In 1862, the first discovery of oil in the American

West occurred a few miles north of Canon City. Shortly thereafter, production was booming in the Florence oil field *(3)*.

Cattle ranches began operating along the Arkansas River in the 1850's. Most of the cattle had been driven from Missouri, Kansas, or Texas. By the late 1880's, the cattle industry was the most profitable business in the area.

A territorial prison was built in Canon City in 1871. Six years later, this prison became the Colorado State Penitentiary *(3)*.

In the late 1890's and early 1900's, Florence, Coal Creek, Rockvale, and Williamsburg were among the most important industrial towns in Colorado. Florence had eight ore mills that treated gold from the Cripple Creek-Victor district. Coal mines, oil wells, and smelting industries were also in operation. The population of the survey area was approximately 7,000.

In 1907, the Beaver Land and Irrigation Company was formed to provide irrigation for the fruit and vegetable crops in Beaver Park. Soon thereafter, the town of Penrose was established *(3)*.

In 1910, the movie industry came to Canon City. Several westerns were filmed in the area during the early part of the century *(3)*, and many more films have been produced in Fremont County in recent years.

By the turn of the century, Royal Gorge had become a popular tourist attraction. In 1929, the world's highest suspension bridge was built across the Gorge *(3)*. Royal Gorge continues to attract large numbers of people to Fremont County.

Water Supply

The Arkansas River and its major tributaries are the principal sources of surface water in the survey area. Snowmelt from the mountainous areas in and adjacent to the survey area is a critical source of surface water. The water held in the snows of important watersheds is closely monitored and directly determines the amount of water that will be available for irrigation and for industrial and municipal uses.

Brush Hollow Reservoir is the only major storage reservoir in the survey area. The water diverted from Beaver Creek is stored in the reservoir and is used for irrigation in the community of Penrose. The water stored in the Deweese Reservoir in Custer County is released into and diverted from Grape Creek and is used for irrigation in the Canon City area. A small amount of water is released from Wrights Reservoir in Teller County to supplement the water diverted from the direct flow of Fourmile Creek. A small amount of the water stored in Skagway Reservoir in Teller County is available for use in Penrose. Many small ponds have been constructed to temporarily store water for livestock, to control flooding, and to reduce the hazard of erosion.

The principal source of ground water is unconsolidated alluvium on the flood plains and terraces of the major streams. Ground water is mainly used for domestic, municipal, and livestock watering uses. A smaller amount is used for commercial applications.

The water diverted from streams and distributed by surface ditches is the dominant source of irrigation water for cropland. Irrigation wells supply water for a few gardens and small areas of cropland.

There is a nearly perennial shortage of water for irrigation in the survey area. In many years the amount of water is insufficient for adequate irrigation of the areas that are in production. Precipitation and snowmelt provide an adequate supply of water in the mountainous areas but are insufficient for supplying water to all of the irrigable land in the eastern part of the survey area.

Industry and Recreation

Fremont County has a diverse economy. Tourism, farming and ranching, and the production of fruit and cider are important factors in this economy. Also, the Colorado Department of Corrections operates a number of correctional facilities in the county.

Coal mining and oil production are also significant in the survey area. Other mined or processed minerals include bentonite, gypsum, decorative rock, and uranium ore. Products manufactured in Fremont County include cement, wallboard, electronic equipment, and conveyors.

The Fremont County area has attracted a growing population of retired citizens. This segment of the population is served by the retirement home and health care industries.

The survey area also offers a variety of recreational opportunities. Rafting and kayaking are popular on the Arkansas River. The mountains offer opportunities for hiking, camping, and big-game hunting. Fishing is also popular in the Arkansas River, Brush Hollow Reservoir, and many streams.

Fremont County features many scenic areas (fig. 2). The famous Royal Gorge and other canyons are along U.S. Highway 50 west of Canon City. Phantom Canyon is accessed by State Highway 67.

Agriculture

Agriculture developed over a period of several decades in Fremont County. Raising cattle and producing corn were part of the trading activities along Hardscrabble Creek in the 1840's and 1850's *(3)*.

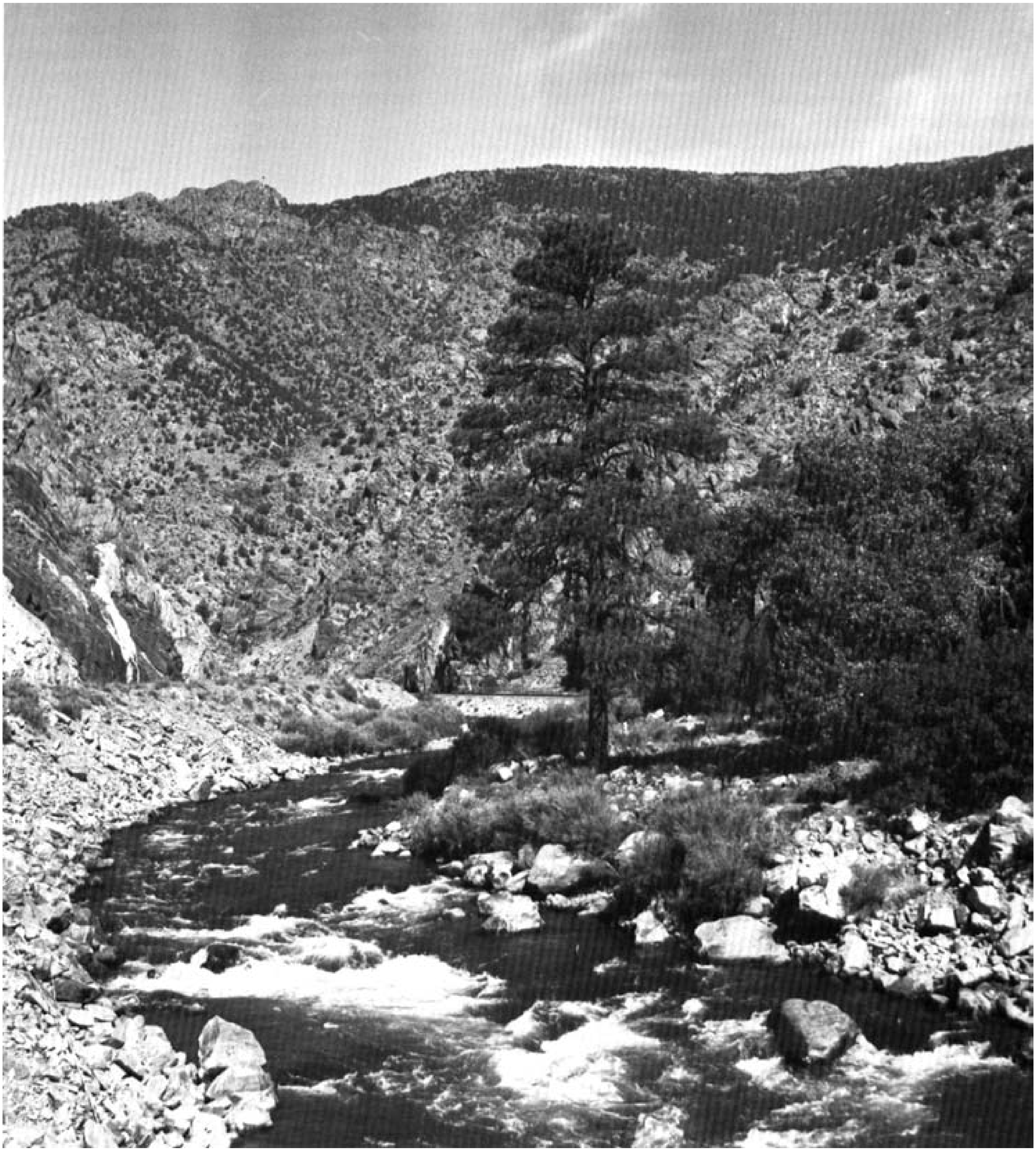

Figure 2.—This scenic canyon and the Arkansas River flowing through it offer many recreational opportunities.

By the early 1860's, ranching had increased. The ranches provided meat for the mining districts of South Park and Leadville and for nearby towns *(3)*.

The cattle industry continued to grow as it supplied meat for the mining districts and later for the coal camps. The construction of railroads that provided access to the East for the mining and agricultural industries also helped to expand the cattle market. The raising of cattle continues to be an important part of the agricultural industry in Fremont County.

The mining camps provided a ready market for fresh fruit, vegetables, and dairy products. An important early activity near Florence and Canon City was the development of water conveyance systems to divert water from streams to cropland.

William Lee planted the first apple orchard in Colorado near Canon City. In 1867, Jesse Frazier planted the first orchard in Florence and the first tree nursery in the Colorado Territory. By 1895, the fruit industry was flourishing. Apples were the principal fruit crop, but many other fruits provided profitable yields.

Until the 1930's, large quantities of fruit and vegetables were produced and shipped to other areas. By World War II, production had decreased significantly. Most orchards soon were replaced by urban development. A few commercial orchards are currently operating in Canon City and Penrose.

Field crops are the most highly valued crops in Fremont County. Hay generally accounts for about two-thirds of the total crop production each year *(4)*. Hay is produced in many parts of the survey area, but the production of other crops is mainly limited to the southeastern part. About 1,000 acres of nonirrigated cropland in southeastern Fremont County is planted to winter wheat *(4)*.

The acreage used for crops has gradually decreased since World War II, especially near Canon City, Florence, and Penrose. Reasons for this decline in crop production include urban development, changing markets, and the loss of water resources to domestic uses. About 1.5 percent of the survey area is presently used as cropland *(4)*.

The Fremont County Soil Conservation District was organized in April 1946 to assist farmers and ranchers in the development of land management practices that help to control erosion and improve water quality.

Physiography and Drainage

The survey area features a wide variety of landforms, including high mountain peaks, high valleys and plateaus, and open plains. The area consists of parts of two major physiographic provinces. The Southern Rocky Mountains province covers about three-fourths of the survey area, and the upper Great Plains province covers the southeastern one-fourth of the area. A narrow zone between the two provinces is characterized by prominent hogbacks of sharply folded and thrust-faulted strata.

The plains occur as relatively narrow protrusions extending along the Arkansas River. They are bounded by the Wet Mountains on the west and by the southern foothills of the Front Range on the north. Skyline Ridge, along the western edge of Canon City, marks the western edge of the protrusion into the Rocky Mountains that is known as the Florence-Canon City Embayment *(5)*. The foothills of the mountains ring the embayment and extend in a narrow band toward Chaffee County on either side of the Arkansas River. The foothills are characterized by hogbacks and cuestas in areas of sedimentary bedrock and by rugged hills bordering the deep canyons along the Arkansas River. They include some small basins. The foothills are moderately sloping to steep, and the basins are gently sloping.

The plains are gently sloping to rolling and are mainly underlain by limestone, shale, and sandstone. They have been dissected into narrow, deep canyons along the major drainageways. The westernmost reaches of the grasslands along the Wet Mountains are characterized by long slopes that are deeply dissected by streams and drop gently toward the northeast. The terraces formed in alluvial deposits of Pleistocene age that have been locally dissected and reworked by fluvial processes.

A rugged, scenic area with mountains and foothills is in the northeastern part of the survey area. It forms a western pendant of the southern tip of the Front Range. This pendant of Pikes Peak granite and granodiorite divides the embayment from the Cripple Creek Plateau.

The northwestern part of Fremont County is covered by mountains, mesas, and intermontane parks with volcanic soil materials that form the southern boundary of South Park in Park County. The South Park Basin protrudes slightly into the northwest corner of the survey area.

Mountains and foothills of uplifted sedimentary and metasedimentary strata are in much of western Fremont County. They form the eastern foothills of the Mosquito and Sangre de Cristo Ranges, which border much of the western part of the survey area. The northern end of the Wet Mountain intermontane valley slightly protrudes into the southwest corner of the survey area. The gently sloping to moderately sloping fans and terraces of glacial outwash lead to the east-northeast from the Sangre de Cristo Range. Fans and terraces of alluvium leading to the Arkansas River are south of Howard and Coaldale.

Rugged mountains of gneiss and granite separate the Arkansas River from the Deweese Plateau between the lower Wet Mountain Valley and the Wet Mountains. The Wet Mountains protrude from the south, mainly into the San Isabel National Forest.

Elevation ranges from about 4,900 feet above sea level on the eastern boundary of the survey area, where the Arkansas River flows into Pueblo County, to about 11,700 feet on Waugh Mountain in the northwestern part of the area. Elevation is generally about 5,500 feet or less on the plains, 5,500 to 8,000 feet in the foothills, and 8,500 to 10,000 feet in the mountainous areas.

The Arkansas River and its tributaries drain Fremont County. The river generally flows through the survey area from west to east in a zigzag pattern. Hardscrabble Creek and Oak Creek are principal tributaries that drain the southeastern portion of the county. Beaver Creek and Eightmile Creek drain the northeastern part of the county, and Currant Creek and Fourmile Creek drain the north-central part. Important tributaries in the northwestern part include Badger, Bernard, Cottonwood, and Tallahassee Creeks. Stout Creek and Cherry Creek are two of the principal streams in the western part of the survey area. Texas Creek and Grape Creek enter Fremont County from the Wet Mountain Valley to the south. Along with Copper Gulch, these creeks drain the southern part of the survey area.

Geology

Alexander D. Elkin, Jr., geologist, Natural Resources Conservation Service, prepared this section.

The geologic formations in the survey area may be grouped according to age and type. They include Precambrian metamorphic and intrusive igneous rocks, including gneiss, quartzite, and granitic rocks; sedimentary rocks of Paleozoic age, which consist mainly of sandy siltstones and shales, sandstones, and conglomerates that have lesser amounts of quartzite, dolomite, and limestone; sedimentary rocks of Mesozoic age, including shales, siltstones, sandstones, and limestones; Tertiary sediments and volcanic rock; and surficial deposits of Quaternary age.

A Precambrian complex of metamorphic and igneous crystalline rocks is the base upon which marine and continental sedimentary rocks from the Paleozoic and Mesozoic eras were deposited. Near the end of the Mesozoic and in the early Tertiary, the Laramide orogeny was deposited and the accompanying major folding and faulting of the rocks took place. Erosion, which was associated with the uplift of the area, removed the Paleozoic and Mesozoic rocks in much of the area. Major structural basins, which were formed by faulting, include the northern end of the Wet Mountain Valley, the Pleasant Valley area in the west, and the southern end of the South Park area in the north. Tertiary sediments were deposited in these basins, which were also the sites of much volcanic activity. In some places, thick sequences of a variety of volcanic rocks were laid down. The present physiography of the area was shaped largely in Quaternary time by the action of streams, mass wasting, and wind.

The Precambrian rocks include gneiss, which occurs over a large area in the south-central part of Fremont County and in smaller areas in the Currant Creek drainage in the north-central part of the county. The gneiss is mainly layered and has a biotite-quartz-plagioclase composition. Precambrian granitic rocks, which consist mainly of granodiorite and some quartz diorite and quartz monzonite, occur in large areas in the northeastern, north-central, and western parts of the survey area and in scattered locations in other parts of the survey area.

Rocks of Paleozoic age crop out in the western part of the county along both sides of the Arkansas River Valley and in the Park Mountain-Red Gulch area. In the northeastern part of the county, Paleozoic rocks occur in a narrow band of outcrop that extends around Canon City to the west, north, and northeast in the Threemile Park, Shaws Park, Red Rock Park, Garden Park, Sixmile Park, Phantom Canyon, and upper Beaver Creek areas. The lower 900 feet of the Paleozoic section, comprising formations ranging from Cambrian to Mississippian in age, is chiefly dolomite and limestone and includes smaller amounts of quartzite. Overlying this section is a series of predominantly clastic rocks of Pennsylvanian and Permian age. The rocks include dark gray shale, siltstone, and sandstone of the Belden Formation, which is nearly 500 feet thick; red, green, and gray shale, siltstone, and sandstone with some gypsum and limestone beds in the Minturn Formation, which is about 4,000 feet thick; several thousand feet of red sandstone, conglomerate, and siltstone of the Sangre de Cristo Formation in the western part of Fremont County; and the Fountain Formation and Lyons Sandstone in the eastern part of Fremont County.

Climate

Summers are warm or hot in most of the valleys in the survey area but are much cooler in the mountains. Winters are cold in the mountains. Valleys are colder than the lower slopes of the adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year, and enough snowpack accumulates during winter to supply sufficient water for agriculture in most areas and to supply downstream users. In the valleys, summer precipitation falls as showers, and some thunderstorms occur. In winter the snow cover in unshaded areas of valleys and on south-facing mountain slopes often melts within a few days of snowfall.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Canon City and Salida, Colorado, for the period between 1951 and 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 38 degrees at Canon City and 30 degrees at Salida. The average daily minimum temperature is 24 degrees at Canon City and 14 degrees at Salida. The lowest temperature on record, which occurred at Salida on February 1, 1951, is -33 degrees. In summer, the average temperature is 73 degrees at Canon City and 64 degrees at Salida. The average daily maximum temperature is about 84 degrees. The highest recorded temperature, which occurred at Canon City on July 11, 1954, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 13 inches at Canon City and 11 inches at Salida. Of this, 65 percent usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 2.74 inches at Canon City on May 18, 1955. About 1.75 inches fell at Salida on October 29, 1961. Thunderstorms occur on about 60 days each year.

Average seasonal snowfall is about 37 inches at Canon City and 52 inches at Salida. The greatest snow depth at any one time during the period of record was 25 inches at Canon City and 42 inches at Salida. On the average, at least 1 inch of snow is on the ground for 2 days at Canon City and for 6 days at Salida each year. The number of such days varies greatly from year to year.

Average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The sun shines about 80 percent of the time possible in summer and 75 percent in winter. The prevailing wind is from the north-northeast. Average windspeed is highest, about 12 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analysis. Soil scientists interpret the data from these analyses as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils within the survey areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Map Unit Descriptions

Soils on Plains

These soils make up about 11 percent of the survey area. They are level and steep. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 12 inches, the average annual air temperature is 52 degrees F, and the average frost-free season is 160 days.

These soils are shallow to deep and are well drained. They formed in alluvium derived dominantly from shale, limestone, and eolian sands and silt and in residuum derived dominantly from shale and limestone.

The soils are used mainly for irrigated crops, hay and pasture, or orchards. They are also used as rangeland.

1. Limon-Midway-Shanta

Deep and shallow, well drained, level to steep soils; on foot slopes, stream terraces, fans, fan terrace edges, knolls, knobs, hills, and ridges

This map unit is in the southeastern part of the survey area. It is characterized by open, grassy flood plains and terraces along the Arkansas River, steep terrace breaks, and uplands that are occasionally dissected by drainageways. Slopes range from 0 to 40 percent. The vegetation is mainly grasses. Elevation is 5,100 to 5,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is 52 degrees F, and the average frost-free period is 160 days.

This unit makes up about 4 percent of the survey area. It is about 30 percent Limon and similar soils, 30 percent Midway and similar soils, 20 percent Shanta and similar soils, and 20 percent soils of minor extent.

Limon soils are on foot slopes, stream terraces, and fans. These soils are deep. They formed in alluvium derived dominantly from shale.

Midway soils are on ridges, knolls, knobs, hills, and terrace edges. These soils are shallow. They formed in residuum derived dominantly from shale. They are clayey throughout.

Shanta soils are on stream terraces. These soils are deep. They formed in stratified alluvium. They are loamy throughout.

Of minor extent in this unit are Cascajo, Wann, Gaynor, and Shingle soils and Aquic Ustifluvents. Cascajo soils are on moderately sloping to steep terrace edges. Wann soils are on level stream terraces. Gaynor and Shingle soils are on undulating to hilly plains, side slopes of fan terrace remnants, and foot slopes. Aquic Ustifluvents are on stream terraces and flood plains.

This unit is used as rangeland, hayland, or pasture.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as walkingstick cholla, yucca, and rabbitbrush, increase or invade.

The Limon soils are fairly well suited to the production of crops. Alfalfa and alfalfa-grass mixtures are commonly grown. The main limitations are slow permeability and poor tilth. Without proper management of irrigation water, the soils are subject to a buildup of salts in the root zone.

The Shanta soils are well suited to the production of crops.

The soils in this unit support rangeland wildlife, such as antelope, cottontail rabbit, and coyote.

If the Limon soils are used for homesite development, the main limitations are the shrink-swell potential, the slow permeability, and, in some areas, the seasonal high water table. Conventional septic tank absorption fields do not function adequately because of the slow permeability and the seasonal high water table.

The Midway soils are poorly suited to homesite development. The main limitations are the shallow depth to shale, the shrink-swell potential, slow permeability, and the slope.

If the Wann soils are used for homesite development, the main limitation is the potential for flooding. In some areas, insufficiently treated effluent from conventional septic tank absorption fields can contaminate the ground water during periods of peak flow of the Arkansas River.

2. Kim

Deep, well drained, level to moderately sloping soils; on plains, breaks, and fan and stream terraces

This map unit is in the southeastern part of the survey area. It is characterized by open, grassy plains and terraces. Slopes range from 0 to 10 percent. The vegetation is mainly grasses. Elevation is 5,100 to 6,000 feet. The average annual precipitation is about 12 inches, the average annual air temperature is 52 degrees F, and the average frost-free period is 160 days.

This unit makes up about 2 percent of the survey area. It is about 75 percent Kim and similar soils and 25 percent soils of minor extent.

Kim soils formed in alluvium and in eolian sands and silt. They are loamy throughout.

Of minor extent in this unit are Fort Collins, Manzanola, Cascajo, and Otero soils and areas of moderately well drained and somewhat poorly drained Kim soils. Fort Collins and Manzanola soils are on gently sloping plains, fans, and fan terraces. Cascajo soils are on moderately steep breaks and terrace edges. The moderately well drained and somewhat poorly drained Kim soils are on stream terraces. Otero soils are on side slopes.

Most areas of this unit are used as rangeland or for irrigated hay and pasture. Some areas are used for orchards.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as walkingstick cholla, yucca, and rabbitbrush, increase or invade.

This unit is well suited to the production of crops. Alfalfa and alfalfa-grass mixtures are commonly grown. A smaller acreage is used for apples and other fruit. The main limitation is the potential for erosion in areas where the soils are not adequately protected by vegetation.

The soils in this unit support rangeland wildlife, such as prairie pronghorn, cottontail rabbit, and coyote.

This unit is well suited to homesite development in most areas. If the somewhat poorly drained Kim soils are used for homesite development, the main limitation is a seasonal high water table at a depth of 2 to 6 feet. If the Manzanola soils are used for homesite development, the main limitations are the shrink-swell potential and slow permeability.

3. Manvel-Penrose-Minnequa

Deep to shallow, well drained, level to steep soils; on plains, terraces, foot slopes, fans, canyonsides, breaks, ridges, and hogbacks and in swales

This map unit is in the southeastern part of the survey area. It is characterized by open, grassy uplands that are occasionally dissected by narrow, steep-sided canyons with limestone walls. Slopes range from 0 to 40 percent. The vegetation is mainly grasses in areas of moderately deep and deep soils and grasses with open stands of juniper in areas of shallow soils. Elevation is 5,000 to 5,700 feet. The average annual precipitation is about 12 inches, the average annual air temperature is 52 degrees F, and the average frost-free period is 160 days.

This unit makes up about 5 percent of the survey area. It is about 30 percent Manvel and similar soils, 30 percent Penrose and similar soils, 20 percent Minnequa and similar soils, and 20 percent soils of minor extent.

Manvel soils are on stream terraces, fans, foot slopes, and plains and in swales. These soils are deep. They formed in alluvium derived dominantly from limestone and shale. They are loamy throughout.

Penrose soils are on plains, canyonsides, breaks, ridges, and hogbacks. These soils are shallow. They formed in residuum derived dominantly from limestone. They are loamy throughout.

Minnequa soils are on plains, ridges, and breaks. These soils are moderately deep. They formed in residuum derived dominantly from limestone and shale. They are loamy throughout.

Of minor extent in this unit are Wiley, Manzanola, Shingle, and Cascajo soils. Wiley and Manzanola soils are on nearly level to gently sloping fans and plains. Shingle and Cascajo soils are on moderately steep breaks, knolls, and terrace edges.

This unit is used as rangeland, irrigated hayland, or pasture or for orchards.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as walkingstick cholla, yucca, and rabbitbrush, increase or invade.

The Manvel soils are well suited to the production of crops. Alfalfa and alfalfa-grass mixtures are commonly grown. A smaller acreage is used for apples and other fruit. The main limitation is an inadequate amount of water for optimum yields in most years. The soils are subject to wind erosion and water erosion in areas where they are not adequately protected by vegetation.

The soils in this unit support rangeland wildlife, such as prairie pronghorn, cottontail rabbit, and coyote.

Areas of Manvel soils, which support grasses but have few trees, are well suited to homesite development. Minnequa soils, which also are in open, grassy areas, are generally well suited to homesite development in areas where the slope is less than about 8 percent. Areas of soils that are less than 40 inches deep over bedrock are not suited to conventional septic tank absorption fields. Untreated effluent can reach the bedrock and be transported downslope along the horizontal fractures of the bedrock. In areas without a community sewage system, the depth to bedrock should be checked on each planned homesite.

Soils and Rock Outcrop on Foothills

This group makes up about 43 percent of the survey area. The soils are level to extremely steep. Elevation is 5,300 to 8,500 feet. The average annual precipitation is 12 to 13 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free season is 100 to 150 days.

These soils are shallow to deep and are well drained. They formed in alluvium, colluvium, residuum, or loess derived dominantly from igneous, metamorphic, and sedimentary rocks.

The soils are used mainly for noncommercial woodland, rangeland, wildlife habitat, recreation, or livestock grazing or for irrigated crops or pasture and hay.

4. Bronell-Martinsdale-Amalia

Deep, well drained, gently sloping to steep soils on fans, fan terraces, ridges, foot slopes, and mountainsides

This map unit is in the western and southern parts of the survey area. Some areas consist of terraces that are deeply dissected into a pattern of hills and fingerlike ridges by perennial and intermittent streams. Other areas consist of broad, gently sloping terrace tops with steep edges along drainageways and the lower ends of terraces. The unit also is on undulating uplands or broad convex slopes separated by narrow drainageways. Slopes range from 2 to 50 percent. The vegetation is mainly pinyon and juniper in the steeper areas and is mainly grasses on fans, foot slopes, and stream terraces. Elevation is 6,600 to 8,500 feet. The average annual precipitation is about 13 inches, the average annual air temperature is 45 degrees F, and the average frost-free period is 100 days.

This unit makes up about 8 percent of the survey area. It is about 30 percent Bronell and similar soils, 25 percent Martinsdale and similar soils, 15 percent Amalia and similar soils, and 30 percent soils of minor extent.

Bronell soils are on gently sloping to steep fans, fan terraces, ridges, and foot slopes. They formed in alluvium. They are loamy and gravelly throughout.

Martinsdale soils are on gently sloping to steep fans and foot slopes of intermontane basins. They formed in alluvium. They are loamy throughout.

Amalia soils are on mountainsides. They formed in colluvium derived dominantly from andesite and breccia. They are loamy and gravelly throughout.

Of minor extent in this unit are Curecanti, Kerhayden, Larand, Shrine, Tecolote, Jodero, Larkson, Querida, Mussel, and Cascajo Variant soils and Aquolls, rock outcrop, and riverwash. Curecanti, Kerhayden, Larand, and Shrine soils and the poorly drained Aquolls are on terraces and fans. Tecolote, Jodero, and Larkson soils are on terraces. Rock outcrop and riverwash are along the Arkansas River and its major tributaries. Querida, Mussel, and Cascajo Variant soils are on fans, terraces, and foot slopes.

This unit is used mainly as noncommercial woodland or as rangeland. It also is used for irrigated hay and pasture.

Wood products include firewood, pinyon nuts, wood for fence posts, and Christmas trees. In some areas, however, the pinyon and juniper have been chained. In other areas the slope limits access to these products.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as broom snakeweed, kochia, and Colorado bee plant, increase or invade.

The wooded areas of this unit support woodland wildlife, such as mule deer, cottontail rabbit, porcupine, and mountain lion. Mule deer and cottontail rabbit also use the open, grassy areas of this unit for food and cover.

This unit is well suited to homesite development in most areas. It is poorly suited in areas where the slope is greater than about 15 percent.

5. Ustic Torriorthents-Rock outcrop-Coaldale

Rock outcrop and shallow, well drained, steep to extremely steep soils; on mountainsides and hogbacks

This map unit is in the western part of the survey area. It occurs as a band of irregular width along both sides of the Arkansas River and Grape Creek. It also is in the northeastern part of the survey area, along the south end of Phantom Canyon. It is characterized by long, steep side slopes that are dissected by ridges and narrow drainageways. An area to the north and west of Howard consists of a series of hogbacks formed by the uneven erosion of resistant and erosive bedrock strata. Slopes range from 20 to 80 percent. The vegetation is mainly pinyon and juniper. Elevation is 6,400 to 8,500 feet. The average annual precipitation is about 13 inches, the average annual air temperature is 45 degrees F, and the average frost-free period is 100 days.

This unit makes up about 18 percent of the survey area. It is about 35 percent Ustic Torriorthents and similar soils, 20 percent Rock outcrop, 15 percent Coaldale and similar soils, and 30 percent soils of minor extent.

Ustic Torriorthents are mainly shallow, but they are moderately deep or deep in some areas. They are on mountainsides. They formed in residuum derived dominantly from granodiorite and gneiss. In many areas about 25 percent of the surface is covered with boulders. The soils are loamy and cobbly and are underlain by bedrock within a depth of 20 inches.

Rock outcrop consists of areas of exposed sandstone, gneiss, or granodiorite on mountainsides and hogbacks. The outcrops occur as short vertical cliffs, boulder projections, and ledges. Some outcrops consist only of the exposed surface of the bedrock strata. Narrow bands of sandstone alternating with bands of soil are exposed on some extremely steep slopes to the north and west of Howard.

Coaldale soils are shallow and are on mountainsides. They formed in residuum derived dominantly from granite and gneiss. They are loamy and gravelly throughout.

Of minor extent in this unit are Swissvale, Rentsac, Casvare, Resort, Teaspoon, Redcameron, Bronell, Querida, and Mussel soils and Haploborolls. Swissvale, Rentsac, Casvare, and Resort soils are on mountainsides. Haploborolls are on north-facing mountainsides. Teaspoon soils are on mountainsides and hogbacks. Redcameron soils are on hogbacks. Bronell, Querida, and Mussel soils are on foot slopes and in drainageways.

This unit is used mainly for wildlife habitat or recreation. It also is used for limited livestock grazing and as noncommercial woodland.

The main limitations in most areas of this unit are the slope, the depth to bedrock, and a low available water capacity. Livestock grazing is limited mainly to areas on foot slopes and in drainageways. Access to wood products, such as firewood and Christmas trees, also is limited.

This unit supports woodland wildlife, such as mule deer, porcupine, and mountain lion.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

6. Travessilla-Ustic Torriorthents-Roygorge

Shallow to deep, well drained, gently sloping to steep soils; on fan terrace edges, hills, ridges, hogbacks, cuestas; canyonsides, and mountainsides

This map unit is in the eastern part of the survey area. It is characterized by broad, convex side slopes that are dissected by narrow, steep drainageways. Slopes range from 5 to 50 percent.

The vegetation is mainly pinyon and juniper. Elevation is 5,500 to 6,900 feet. The average annual precipitation is about 13 inches, the average annual air temperature is 50 degrees F, and the average frost-free period is 130 days.

This unit makes up about 11 percent of the survey area. It is about 30 percent Travessilla and similar soils, 30 percent Ustic Torriorthents and similar soils, 15 percent Roygorge and similar soils, and 25 percent soils of minor extent.

Travessilla soils are on gently sloping to steep hills, hogbacks, ridges, cuestas, and canyonsides. They formed in residuum derived dominantly from sandstone. They are sandy loam and are underlain by bedrock within a depth of 20 inches.

Ustic Torriorthents are on strongly sloping to steep fan terrace edges and hills. They formed in residuum and colluvium derived dominantly from thinly bedded sandstone, siltstone, and shale. They are loamy or clayey and are underlain by bedrock at a depth of 15 to 60 inches.

Roygorge soils are on moderately steep or steep mountainsides. They formed in residuum derived dominantly from gneiss and granite. They are loamy and gravelly and are underlain by bedrock within a depth of 20 inches.

Of minor extent in this unit are Louviers, Rizozo, Wesix, Pendant, Wages, Kim, Neville, Otero, Cerrillos, and Sedillo soils and rock outcrop. Louviers, Rizozo, Wesix, and Pendant soils are on hills, ridges, hogbacks, and mountainsides. Wages, Kim, Neville, Otero, and Cerrillos soils are in major drainageways and on foot slopes. Sedillo soils are on fan terraces and fan terrace edges. Rock outcrop is on mountainsides.

This unit is used for noncommercial woodland, wildlife habitat, recreation, or livestock grazing.

The main limitations for most uses are the slope, the depth to bedrock, and a low available water capacity. Wood products include firewood, wood for fence posts, Christmas trees, and pinyon nuts. Access to these products is limited in some areas, however.

The soils in this unit support woodland wildlife, such as mule deer, porcupine, and mountain lion.

This unit is poorly suited to homesite development in many areas. The main limitations are the slope and the depth to bedrock.

7. Kim-Nunn-Fort Collins

Deep, well drained, level to moderately sloping soils on fan terraces, foot slopes, side slopes, breaks, and fans

This map unit is in the eastern part of the survey area. It is characterized by open, grassy uplands. Slopes range from 0 to 15 percent. The vegetation is mainly grasses and forbs. Elevation is 5,300 to 6,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is 50 degrees F, and the average frost-free period is 150 days.

This unit makes up about 6 percent of the survey area. It is about 50 percent Kim and similar soils, 15 percent Nunn and similar soils, 15 percent Fort Collins and similar soils, and 20 percent soils of minor extent.

Kim soils are on breaks, side slopes, fan terraces, and fans. They formed in alluvium and wind-deposited fine sand and silt derived dominantly from sandstone, shale, and granite. They are loamy throughout.

Nunn soils are on fans, fan terraces, and foot slopes. They formed in alluvium and loess. They are clayey throughout.

Fort Collins soils are on fan terraces and fans. They formed in alluvium. They are loamy throughout.

Of minor extent in this unit are Neville, Wiley, Otero, Cerrillos, Wages, Shingle, and Shanta soils and Ustic Torriorthents. Neville, Wiley, Otero, Cerrillos, and Wages soils are on fans, fan terraces, and foot slopes. Ustic Torriorthents and Shingle soils are on breaks. Shanta soils are on terraces of perennial streams.

This unit is used as rangeland or irrigated cropland.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as walkingstick cholla, yucca, and rabbitbrush, increase or invade.

The main crops are alfalfa and other hay crops. The Kim soils are subject to erosion in areas where they are not adequately protected by vegetation. The main limitations in areas of the Nunn soils are restricted permeability and a limited supply of water for irrigation. Excessive cultivation on the Nunn soils can result in the formation of a tillage pan that restricts the penetration of roots and water below the plow layer.

The soils in this unit support rangeland wildlife, such as cottontail rabbit and coyote.

The Kim and Fort Collins soils are well suited to homesite development. If the Nunn soils are used for homesite development, the main limitation is the slow permeability in the subsoil.

Soils and Rock Outcrop on Mountains

This group makes up about 46 percent of the survey area. The soils are gently sloping to extremely steep. Elevation is 6,800 to 11,600 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free season is 70 to 95 days.

These soils are shallow to deep and are well drained. They formed in residuum, colluvium, glacial outwash, till, and alluvium derived dominantly from igneous, metamorphic, and sedimentary rocks.

The soils are used mainly for woodland, wildlife habitat, livestock grazing, recreation, or rangeland.

8. Seitz-Granile-Larand

Deep, well drained, gently sloping to steep soils; on mountainsides and on a moraine

This map unit is in the northwestern and northeastern parts of the survey area. It is characterized by broad, convex slopes that are separated by narrow drainageways. Perennial streams flow through the major, deeply dissected drainageways. The map unit also is on strongly sloping mountaintops. Slopes range from 4 to 50 percent. The vegetation is mainly conifers. Elevation is 8,200 to 11,600 feet. The average annual precipitation is about 18 inches, the average annual air temperature is 41 degrees F, and the average frost-free period is 70 days.

This unit makes up about 8 percent of the survey area. It is about 35 percent Granile and similar soils, 25 percent Seitz and similar soils, 15 percent Larand and similar soils, and 25 percent soils of minor extent.

Seitz soils are on north-facing mountainsides. They formed in colluvium derived dominantly from granite, breccia, tuff, andesite, and rhyolite. The surface is covered with a mat of fir litter about 2 inches thick. The surface layer is loamy and gravelly. The subsoil is clayey and cobbly. Below this to a depth of 60 inches or more the soils are loamy and cobbly.

Granile soils are on mountainsides. They formed in colluvium and residuum derived dominantly from granodiorite and sandstone. The surface is covered with a mat of fir litter about 2 inches thick. About 0 to 5 percent of the surface is covered with stones. The soils are loamy and gravelly throughout.

Larand soils are on mountainsides and on a moraine. They formed in colluvium, glacial outwash, and till. The surface is covered with a mat of fir and spruce litter about 1 inch thick. The surface layer is loamy and gravelly. The subsoil is loamy and cobbly. Below this to a depth of 60 inches or more the soils are sandy and cobbly.

Of minor extent in this unit are rock outcrop and Lakehelen, Guffey, Herakle, Wahatoya, Raleigh, Bushvalley, Bundo, Tolex, and Wetmore soils on mountainsides, canyonsides, and ridges; Tellura soils on fans and terraces; and Adderton soils in drainageways and on toe slopes.

This unit is used mainly for woodland, wildlife habitat, or recreation. It also is used for limited livestock grazing. Spruce, fir, and pine are harvested mainly from north-facing side slopes.

This unit is suited to the limited production of spruce, fir, or pine in many areas. The main limitation is the slope. Care in the use of equipment and in the construction of logging trails and roads helps to prevent excessive erosion. Livestock grazing is limited mainly to stream valleys and logging trails.

The soils in this unit support woodland wildlife, such as elk, mule deer, porcupine, mountain lion, and black bear.

This unit is poorly suited to homesite development in most areas. The main limitation is the slope.

9. Boyle-Rock outcrop-Resort

Rock outcrop and shallow, well drained, strongly sloping to extremely steep soils; on mountains, ridges, and hills

This map unit is in the northern, south-central, and northeastern parts of the survey area. It is characterized by broad, convex slopes that are separated by narrow, steep drainageways. Perennial and intermittent streams flow in the deep, narrow canyons between the major ridges. The map unit also is on hills and low, narrow ridges that rise above surrounding uplands. Slopes range from 10 to 60 percent. The vegetation is mainly pinyon, juniper, and woody shrubs. Elevation is 6,800 to 8,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is 45 degrees F, and the average frost-free period is 95 days.

This unit makes up about 17 percent of the survey area. It is about 45 percent Boyle and similar soils, 15 percent Rock outcrop, 15 percent Resort and similar soils, and 25 percent soils of minor extent.

Boyle soils are on strongly sloping to steep ridges, hills, and mountainsides. They formed in residuum derived dominantly from gneiss and granite. They are loamy and gravelly and are underlain by bedrock within a depth of 20 inches.

Rock outcrop consists of areas of exposed gneiss and granodiorite. The exposures occur as crags and short cliffs on ridges and steep side slopes. The surface of bedrock is exposed in some areas.

Resort soils are on strongly sloping to steep mountainsides. They formed in residuum derived dominantly from granodiorite. They are loamy and gravelly. Soft granodiorite is within a depth of 20 inches.

Of minor extent in this unit are Cathedral, Tolex, Bronell, Jodero, Fort Collins Variant, and Martinsdale soils. Cathedral and Tolex soils are on mountainsides. Bronell soils are on foot slopes. Jodero soils are on fans and terraces, and Fort Collins Variant and Martinsdale soils are on foot slopes in small parks.

This unit is used for noncommercial woodland, livestock grazing, wildlife habitat, or recreation. Livestock grazing is limited mainly to canyon bottoms and other small parks.

The main limitations for most uses are the slope, the depth to bedrock, and a low available water capacity. Wood products include firewood, wood for fence posts, Christmas trees, and pinyon nuts. Access to these products is limited in many areas, however.

The soils in this unit support woodland wildlife, such as mule deer, porcupine, and mountain lion. These species and other small mammals also use the areas that are not wooded for food and cover.

This unit is poorly suited to homesite development in most areas. The main limitations are the slope and the depth to bedrock.

10. Rogert-Wetmore-Rock outcrop

Shallow, well drained, strongly sloping to extremely steep soils and Rock outcrop; on hills, ridges, mountainsides, and canyonsides

This map unit is in the northern part of the survey area. It is characterized by complex slopes that are dissected into ridges and narrow drainageways. Perennial streams flow in the bottom of deep canyons between the major ridges. Slopes range from 10 to 70 percent. The vegetation is mainly ponderosa pine and grasses in most areas, but on north-facing side slopes it is mainly fir. Elevation is 7,000 to 10,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is 43 degrees F, and the average frost-free period is 90 days.

This unit makes up about 9 percent of the survey area. It is about 40 percent Rogert and similar soils, 25 percent Wetmore and similar soils, 15 percent Rock outcrop, and 20 percent soils of minor extent.

Rogert soils are on strongly sloping to moderately steep hills, ridges, and mountainsides. They formed in residuum derived dominantly from gneiss, granite, granodiorite, or sandstone. They are loamy and gravelly throughout and are underlain by bedrock within a depth of 20 inches.

Wetmore soils are on steep to extremely steep mountainsides and canyonsides. They formed in residuum derived dominantly from gneiss and granite. The surface is covered with a mat of pine and oak litter about 1 inch thick. The soils are loamy and gravelly and are underlain by bedrock within a depth of 20 inches.

Rock outcrop consists of areas of exposed gneiss, granite, and granodiorite. It is mainly on ridges, canyon rims, and the steep, upper parts of side slopes. Granodiorite outcrops commonly occur as bouldery knobs. In areas of gneiss and granite, the outcrops occur as short cliffs and crags that are 10 to 75 feet high.

Of minor extent in this unit are Raleigh, Bundo, dry, Lakehelen, Guffey, Herakle, Granile, Tecolote, and Adderton soils. Raleigh, Bundo, Lakehelen, Guffey, Herakle, and Granile soils are on mountainsides and canyonsides. Tecolote soils are on foot slopes. Adderton soils are on fans and stream terraces.

This unit is used for woodland, wildlife habitat, recreation, or livestock grazing. Livestock grazing is limited mainly to canyon bottoms, foot slopes, and other gently sloping areas.

This unit is poorly suited to the production of timber. The main limitations are a low available water capacity and the slope.

The soils in this unit support woodland wildlife, such as mule deer, cottontail rabbit, porcupine, mountain lion, elk, and black bear.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

11. Bushvalley-Ess-Hoodle

Shallow and deep, well drained, gently sloping to steep soils; on fan terraces, mountainsides, hills, foot slopes, ridges, and mesas

This map unit is in the northwestern part of the survey area. It is characterized by broad, convex slopes that are separated by narrow, steep drainageways. It also includes undulating to hilly intermontane basins that formed in breccia and on mesas. Slopes range from 5 to 50 percent. The vegetation is mainly grasses and shrubs. Some areas in high mountain valleys and drainageways are forested with aspen. Elevation is 8,000 to 11,000 feet. The average annual precipitation is about 18 inches, the average annual air temperature is 42 degrees F, and the average frost-free period is 75 days.

This unit makes up about 12 percent of the survey area. It is about 35 percent Bushvalley and similar soils, 20 percent Ess and similar soils, 15 percent Hoodle and similar soils (fig. 3), and 30 percent soils of minor extent.

Bushvalley soils are shallow and are on mountainsides, ridges, hills, fan terraces, and mesas. They formed in residuum derived dominantly from tuff, breccia, granite, and gneiss. The surface layer and the subsoil are loamy and cobbly. Unweathered bedrock is within a depth of 20 inches.

Ess soils are deep and are on mountainsides, fan terraces, hills, and mesas. They formed in colluvium derived dominantly from tuff, breccia, granite, and gneiss. They are loamy, gravelly, and cobbly throughout.

Hoodle soils are deep and are on fan terraces and foot slopes. They formed in alluvium. They are loamy and gravelly throughout.

Of minor extent in this unit are Tellura, Heath, Morset, Hodden, Sawfork, Youga, Adderton, Cochetopa, Whiteman, and Chittum soils, Cumulic Cryaquolls, Cryoborolls, and rock outcrop. Tellura, Heath, Morset, Hodden, Sawfork, and Youga soils are on fans, terraces, and foot slopes. Adderton and Cochetopa soils and Cumulic Cryaquolls are on toe slopes, in upland drainageways, and on stream terraces.

Figure 3.—A typical landscape in an area of Hoodle loam, 5 to 20 percent slopes. Black Mountain, which is just outside the survey area, is in the background.

Whiteman and Chittum soils, Cryoborolls, and rock outcrop are on mountainsides, foot slopes, hills, and ridges.

Most areas of this unit are used as rangeland or wildlife habitat. A few areas are used for recreation. Other areas produce wood for poles and firewood. Livestock grazing is limited in some areas by the slope.

Range management practices, such as deferred and rotation grazing, cross fencing, and livestock water developments, help to prevent range deterioration and promote the production of desirable plants. It is difficult to replenish grasses on depleted range, and undesirable plants, such as rabbitbrush, pingue, and fringed sagebrush, increase or invade.

Areas of quaking aspen commonly have a lush understory of forage grasses. These stands also provide sawtimber, wood for poles, and firewood.

The soils in this unit support rangeland wildlife, such as cottontail rabbit, coyote, mule deer, and elk. Cottontail rabbit and coyote are adapted to open, grassy areas. Mule deer are adapted to open, grassy areas and brushy areas. Elk find food and cover in dense stands of aspen.

This unit is poorly suited to homesite development in most areas because of the slope and the depth to bedrock. Most areas on gently sloping uplands, fans, foot slopes, and terraces are suitable for homesite development.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils and miscellaneous areas have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to precisely define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Kim loam, 3 to 8 percent slopes, is a phase of the Kim series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Louviers-Travessilla complex, 20 to 50 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Shanta-Nederland association is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example.

This survey area was mapped at two levels of detail. At the more detailed level, map units are narrowly defined. Map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined (fig. 4). Boundaries were plotted and verified at wider intervals. The more detailed level of mapping was used in areas of cropland and in developed or developing urban areas. These areas are generally in the gently sloping or sloping valleys and on plains. The rangeland in southeastern Fremont County also was mapped at the more detailed level. The less detailed level of mapping was generally used in areas of rugged terrain.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1—Adderton loam, 2 to 6 percent slopes. This deep, well drained soil is on stream terraces and toe slopes. It formed in mixed alluvium. The native vegetation is mainly grasses. Elevation is 8,600 to 9,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically dark grayish brown loam about 3 inches thick. The upper 46 inches of the underlying material is mainly loam. The lower part to a depth of 60 inches or more is very gravelly loamy sand. The soil is neutral to a depth of 27 inches and mildly alkaline below that depth. In some areas the soil is slightly effervescent to strongly effervescent below a depth of about 40 inches.

Included with this soil in mapping are areas of Granile soils on the upper toe slopes. Granile soils have a thin, dark surface layer of very gravelly sandy loam and have a high content of rock fragments. They make up about 5 percent of the mapped areas. Also included are areas of soils that are similar to the Adderton soil but are moderately deep. These soils are in the steeper areas. They make up about 5 percent of the mapped areas. Small areas of the poorly drained Cumulic Cryaquolls are along the stream channels.

Permeability is moderate in the Adderton soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, needleandthread, sedges, fringed sagebrush, rabbitbrush, and sleepygrass increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development in most areas. Areas immediately adjacent to streams may be subject to infrequent overflow and probably should not be developed unless protection is provided.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

2—Amalia very gravelly loam, 25 to 50 percent slopes. This deep, well drained soil is on mountainsides and canyonsides. It formed in colluvium derived dominantly from andesite and breccia. The native vegetation is mainly pinyon and juniper. Elevation is 7,000 to 8,500 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

The surface is typically covered with a mat of pinyon litter about 1 inch thick. The surface layer is brown very gravelly loam about 4 inches thick. The upper part of the subsoil is very gravelly clay loam about 9 inches thick. The next part is very gravelly sandy loam about 18 inches thick. Below this is 29 inches of very gravelly loam. The lower part of the subsoil to a depth of 75 inches or more is gravelly loam. The soil is mainly neutral to a depth of 13 inches and is moderately alkaline and calcareous below that depth. A layer having a high content of accumulated calcium carbonate is at a depth of 13 to 31 inches. In some areas the surface layer is very cobbly loam.

Included with this soil in mapping are areas of andesite and breccia rock outcrop on ridges and the

Figure 4.—Travessilla-Rock outcrop complex, 5 to 50 percent slopes, is an example of an area that was mapped at a less detailed level because of the rugged terrain.

steep upper side slopes. These areas make up about 10 percent of the unit. Small areas of soils 20 to 40 inches deep over bedrock are adjacent to the rock outcrop. Some of the outcrops occur as ledges and cliffs. Small areas of talus are below the rock outcrop. Also included are areas of soils on foot slopes and along drainageways. These soils have a surface layer of sandy loam. They have a lower content of rock fragments than the Amalia soil. They make up about 5 percent of the unit. Areas that have large boulders, stones, and cobbles on the surface also make up about 5 percent of the unit.

Permeability is moderate in the Amalia soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as noncommercial woodland, for wildlife habitat, or for livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and true mountainmahogany. The potential production of native understory vegetation in normal years is about 250 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, red threeawn, broom snakeweed, and pricklypear increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in other areas. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil. The site index for mixed pinyon and juniper ranges from about 50 to 80.

This soil is poorly suited to homesite development. It is limited mainly by the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

3—Aquic Ustifluvents. These deep, moderately well drained and somewhat poorly drained soils are on stream terraces and flood plains. They formed in stratified alluvium. Slopes are 0 to 1 percent. The native vegetation is mainly grasses and forbs. Elevation is 4,950 to 5,100 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 155 to 170 days.

These soils are variable, but a profile commonly observed in the survey area has a surface layer of light brownish gray loam about 13 inches thick. The upper 7 inches of the substratum is loam. The lower part to a depth of 40 inches or more is stratified fine sandy loam, loam, and loamy fine sand. Sand and gravel are at a depth of 3 feet or more. Dominant textures between depths of 10 and 40 inches also include loam, silt loam, silty clay loam, and fine sand. In some areas the soils are sandy throughout. The soils are moderately alkaline.

Included in mapping are areas of soils that are dominantly silty clay loam or silty clay above a depth of about 30 inches. These areas make up about 10 percent of the unit. Also included are well drained soils on a few high terraces along Beaver Creek. Stream channels and low flood plains make up about 10 percent of the delineations along Beaver Creek.

Permeability is mainly moderate in the Aquic Ustifluvents. Available water capacity is moderate. Effective rooting depth is limited by a seasonal high water table at a depth of 10 to 40 inches from April through June. Runoff is slow, and the hazard of water erosion is slight. Generally, the soils are nonsaline or slightly saline in the upper 2 feet, but they are moderately saline in a few areas.

Most areas of these soils are used as rangeland or for hay and pasture. A small area is used for irrigated corn and small grain.

The potential plant community is mainly western wheatgrass, inland saltgrass, alkali sacaton, sand dropseed, little bluestem, sedges, big bluestem, willow, and scattered areas of cottonwood. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, kochia, Russian thistle, rabbitbrush, and annual forbs increase. Range seeding is suitable if the range is in poor condition.

Some areas of these soils are well suited to irrigated crops if an adequate supply of irrigation water is available. In most areas the seasonal high water table is sufficiently deep for deep-rooted crops. However, some areas near the channel of the Arkansas River are subject to frequent, damaging floods. The low available water capacity and an excessively rapid rate of water intake are severe limitations in areas of sandy soils.

Irrigation water can be applied by furrow, corrugation, border flooding, flooding from contour ditches, or sprinklers. The water should be applied carefully to prevent the buildup of a high water table. A drainage system may also be needed. In areas where the surface layer is sandy, water should be applied frequently and runs should be short.

Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. If properly managed, suitable areas of these soils can produce 6 tons of irrigated alfalfa hay per acre.

These soils are poorly suited to homesite development. They are limited mainly by the flooding.

The capability classification is IVw, irrigated, and VIw, nonirrigated. The soils are in the Riverbottom #73 range site.

4—Aquolls, 0 to 5 percent slopes. These deep, poorly drained and very poorly drained soils are on fans, fan terraces, and stream terraces. They formed in alluvium. The native vegetation is mainly grasses, rushes, and sedges. Elevation is 6,300 to 8,000 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

These soils are variable, but a profile commonly observed in the survey area has a surface layer of gray fine sandy loam about 23 inches thick. The substratum to a depth of 60 inches or more is fine sandy loam. Much of the area is underlain by a layer of gravel and cobbles at a depth of 5 feet or more. The soils are mildly alkaline or moderately alkaline.

Permeability is moderately rapid. Available water capacity is moderate. A seasonal high water table is at the surface to a depth of 24 inches. Surface ponding is common in low areas. The high water table severely limits rooting depth. These soils are frequently flooded.

These soils are used as rangeland or for hay.

If these soils are used for hay, the main limitations are the wetness and the limited rooting depth. The choice of crops is limited mainly to grass hay or pasture because of the high water table. In many areas the surface remains wet during most of the growing season. Deep-rooted crops, such as alfalfa, require a subsurface drainage system. If properly managed, these soils can produce 4 tons of irrigated hay per acre. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

The potential plant community is mainly sedges, tufted hairgrass, slender wheatgrass, and Nebraska sedge. If the condition of the range deteriorates, sedges, shrubby cinquefoil, and Baltic rush increase. The average annual production of air-dry vegetation is about 3,000 pounds per acre. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

These soils are poorly suited to homesite development. The main limitations are the hazard of flooding and the seasonal high water table.

The capability classification is Vw, irrigated and nonirrigated. The soils are in the Mountain Meadow #241 range site.

5—Arents, 10 to 45 percent slopes. These deep, well drained soils are on manmade hills. They formed in mixed coal-mining spoil and overburden materials that have been redistributed and deposited to a thickness of more than 5 feet. Slopes range from about 5 to 55 percent but are dominantly 10 to 45 percent. Most of the slopes are about 50 to 300 feet long, but the longer, steeper slopes are divided by contour terraces that reduce the effective slope length. Delineations of this unit range from about 5 to 400 acres in size. The soils have been planted to a mixture of trees, grasses, forbs, and shrubs. Elevation is 5,500 to 6,100 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 130 to 150 days.

These manmade soils are highly variable. To the extent possible, soil materials that are suited to supporting plant growth were used to form the upper 2 to 3 feet of the soils. The fine-earth fraction of the soil material varies from loamy sand to silty clay loam. Dominant textures include loam, sandy loam, sandy clay loam, clay loam, and silt loam. The soils are extremely acid to moderately alkaline. In the upper 10 inches, reaction is commonly 5.2 (strongly acid) or higher. The content of boulders, stones, cobbles, and gravel ranges from about 35 percent to 80 percent, by volume, in about 20 percent of the map unit. Generally, the content of hard rock fragments is about 5 to 25 percent in other areas.

Permeability is moderately slow to moderately rapid. The effective rooting depth is variable because of the variable depth to a strongly acid layer. Available water capacity also is variable. Runoff is medium to very rapid, and the hazard of erosion is moderate to very high.

In many areas the soils consist of 20 to 90 percent soft shale and sandstone chips. The color is often highly mixed because of the mixing of various materials, but dry colors are dominantly grayish brown, light brownish gray, and brown. Black or grayish brown shale chips are very common. In a few areas the surface layer is pale yellow sandy loam that has pale yellow sandstone chips. The soils are dominantly nonsaline or slightly saline, but they are commonly saline in areas immediately adjacent to drainageways. The premixed spoil sometimes includes a relatively high content of sulfur in such forms as pyrite. The extent to which the sulfur may result in additional acidity or salinity of these mixed soils is not known.

In some areas short cliffs of sandstone or of sand and gravel border the delineations of this unit. Included in mapping are a few small areas of shallow soils and very small areas of sandstone outcrops. Also included are a few areas of undisturbed native soils, such as Kim, Sedillo, and Travessilla soils. Generally, these areas range from 2 to 5 acres in size.

New drainageways, including some small ponds about one-half acre or less in size, have been constructed in areas of this map unit. Very small groups of boulders are also on the surface in a few areas. Shallow basins about ⅛ acre in size were constructed at widely spaced intervals to catch runoff and improve the survival rate of planted trees, shrubs, and forbs.

A wide range of plant species can be planted on these soils. Common trees planted are pinyon and Rocky Mountain juniper. Important forbs and shrubs include mountainmahogany, Louisiana sagewort, fourwing saltbush, rubber rabbitbrush, and skunkbush sumac. Grasses expected to remain 5 years after seeding include western wheatgrass, sideoats grama, Indian ricegrass, blue grama, and sand dropseed. Little bluestem can be expected to become dominant on north-facing, gravelly slopes. Other native species, including Scribner needlegrass, Gambel oak, pinyon ricegrass, yucca, pricklypear, and walkingstick cholla, can be expected to invade the site over a long period of time. Many areas may eventually support a widely spaced stand of pinyon and juniper and a grassy understory. Some small areas that have an extremely acid surface layer have typically remained barren for about 1 year after planting.

Most areas of these soils are poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. No range site is assigned.

6—Bloom loam, 0 to 2 percent slopes. This deep, poorly drained soil is on stream terraces. It formed in alluvium. The native vegetation is mainly salt-tolerant grasses. Elevation is 4,900 to 5,300 feet. The average annual precipitation is 11 to 12 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 155 to 170 days.

The surface layer is typically mottled, light brownish gray loam about 3 inches thick. The upper part of the substratum is silty clay loam about 46 inches thick, and the lower part is extremely gravelly sand to a depth of 60 inches or more. The soil is moderately alkaline and calcareous.

Permeability is moderate. Available water capacity is high. In most areas the soil is slightly saline or moderately saline in the upper 2 feet. Effective rooting depth is limited for plants that are sensitive to water. A seasonal high water table fluctuates between depths of 6 and 24 inches in the spring and early summer. The soil is subject to occasional, very brief periods of flooding. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this soil are used mainly for irrigated pasture and hay. Some areas are used as rangeland.

The potential plant community is mainly alkali sacaton, western wheatgrass, switchgrass, and inland saltgrass. The average annual production of air-dry vegetation is about 2,000 pounds per acre.

This soil is best suited to irrigated grass crops. Wetness limits the choice of plants and the period of cutting or grazing. It also increases the risk of winterkill. Salt-tolerant species are the most suitable for planting because the high water table tends to cause a concentration of salts in the surface layer. A drainage system and irrigation water management can reduce the concentration of salts.

Irrigation water can be applied by flooding from contour ditches, by corrugation, or by border flooding. Applying the water carefully helps to prevent the buildup of a high water table. A drainage system may also be needed. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

Periodically mowing and clipping the pasture help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Annual applications of nitrogen fertilizer are needed to maintain the production of high-quality irrigated pasture. If properly managed, this soil can produce 2.5 tons of irrigated grass hay per acre.

This soil is poorly suited to homesite development. The main limitations are the wetness and the hazard of flooding.

The capability classification is IVw, irrigated, and VIw, nonirrigated. The soil is in the Salt Meadow #30 range site.

7—Boyle very gravelly sandy loam, 10 to 40 percent slopes. This shallow, well drained soil is on mountainsides and hills. It formed in residuum derived dominantly from gneiss and granite. The native vegetation is mainly pinyon and juniper. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 85 to 110 days.

The surface layer is typically very dark grayish brown very gravelly sandy loam about 3 inches thick. The subsoil is extremely gravelly sandy clay loam about 14 inches thick. Soft gneiss is at a depth of about 17 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Included with this soil in mapping are areas of the deep Bronell and Jodero soils. Bronell soils have a surface layer of very gravelly loam. They are on foot slopes. Jodero soils have a surface layer of sandy loam. They are in drainageways. Bronell soils make up about 5 percent of the unit. Jodero soils also make up about 5 percent of the unit. They are less gravelly than the Boyle soil. Also included are areas of gneiss or granite rock outcrop on the upper part of side slopes and ridges. These areas make up about 5 percent of the unit.

Permeability is moderate in the Boyle soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as noncommercial woodland, for wildlife habitat, or for livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, mountain muhly, and Gambel oak. If the condition of the understory deteriorates, red threeawn, blue grama, pricklypear, and yucca increase. The potential production of native understory vegetation in normal years is about 400 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. In some areas, however, the slope limits access to these products. The use of tree spades for removal of transplants is severely limited by the depth to bedrock and the high content of rock fragments. The site index for pinyon-juniper ranges mainly from 40 to 60.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

8—Boyle-Martinsdale complex, 3 to 20 percent slopes. These soils are in intermontane basins. The native vegetation is mainly pinyon and grasses. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 85 to 110 days.

This unit is about 45 percent Boyle soil and 40 percent Martinsdale soil. The Boyle soil is mainly on hills and ridges. It supports standing or chained pinyon and juniper. The Martinsdale soil is mainly on concave landforms in grassed areas.

Included in mapping are areas of soils that are similar to the Martinsdale soil but are moderately deep. These soils are on the upper side slopes of swales. They make up about 10 percent of the unit. Also included are areas of gneiss or granite rock outcrop on hills and ridges. These areas make up about 5 percent of the unit.

The Boyle soil is shallow and well drained. It formed in residuum derived dominantly from gneiss and granite. Slopes range from 5 to 20 percent. The surface layer is typically very dark grayish brown very gravelly sandy loam about 6 inches thick. The subsoil is extremely gravelly sandy clay loam about 11 inches thick. Soft granite is at a depth of about 17 inches. The soil is neutral.

Permeability is moderate in the Boyle soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Martinsdale soil is deep and well drained. It formed in alluvium derived dominantly from gneiss and granite. Slopes range from 3 to 8 percent. The surface layer is typically dark brown sandy loam about 5 inches thick. The subsoil is sandy clay loam about 40 inches thick. The lower 24 inches of the subsoil has a high content of accumulated calcium carbonate. The substratum to a depth of 60 inches or more is gravelly sandy loam. The soil is neutral to a depth of 11 inches and is moderately alkaline below that depth.

Permeability is moderately slow in the Martinsdale soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This unit is used as rangeland.

The potential plant community on the Boyle soil is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, mountain muhly, and Gambel oak. The potential plant community on the Martinsdale soil is mainly western wheatgrass, needleandthread, blue grama, and fringed sagewort. The average annual production of air-dry vegetation is about 400 pounds per acre on the Boyle soil and 800 pounds per acre on the Martinsdale soil. If the condition of the range deteriorates, blue grama, ring muhly, bottlebrush squirreltail, rabbitbrush, and sleepygrass increase. Range seeding is suitable if the range is in poor condition.

Some areas that are covered with pinyon and juniper are poorly suited to homesite development. The main limitation is the depth to bedrock. Other areas of the unit are well suited to this use.

The capability classification is VIe, nonirrigated. The soils are about 50 percent in the Pinyon-Juniper woodland site and 50 percent in the Mountain Loam, 13- to 18-inch precipitation zone #226 range site.

9—Boyle-Rock outcrop complex, 40 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 7,500 to 8,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 85 to 110 days.

This unit is about 60 percent Boyle soil and 25 percent Rock outcrop. Rock outcrop occurs mainly on the upper part of side slopes and ridges.

Included in mapping are areas of Bronell soils on foot slopes and Jodero soils in drainageways. These soils are deep. Bronell soils have a surface layer of very gravelly loam. They make up about 10 percent of the unit. Jodero soils have a surface layer of sandy loam and are less gravelly than the Boyle soil. They make up about 5 percent of the unit.

The Boyle soil is shallow and well drained. It formed in residuum derived from gneiss or granite. Slopes range from 40 to 55 percent. The surface layer is typically very dark grayish brown very gravelly sandy loam about 3 inches thick. The subsoil is extremely gravelly sandy clay loam about 14 inches thick. Decomposed gneiss is at a depth of about 17 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Permeability is moderate in the Boyle soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of gneiss and granite. It occurs as short cliffs and crags. Slopes range from 40 to 60 percent.

This unit is used as noncommercial woodland or for wildlife habitat. The slope limits access by livestock.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, mountain muhly, and Gambel oak. If the condition of the understory deteriorates, blue grama, pricklypear, red threeawn, and yucca increase. The potential production of native understory vegetation in normal years is about 400 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in the other areas. The use of tree spades for removal of transplants is severely limited by the depth to bedrock and the high content of rock fragments. The site index for pinyon and juniper ranges from 40 to 60.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Boyle soil is in the Pinyon-Juniper woodland site.

10—Bronell gravelly sandy loam, 2 to 15 percent slopes. This deep, well drained soil is on fan terraces and fans. It formed in alluvium. The native vegetation consists mainly of an open to moderately dense stand of pinyon and juniper. Elevation is 6,900 to 7,800 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

The surface layer is typically grayish brown gravelly sandy loam about 16 inches thick. The substratum to a depth of 60 inches or more is very gravelly sandy loam. The soil is moderately alkaline. A layer that has a high content of accumulated calcium carbonate is at a depth of 16 to 26 inches.

Included with this soil in mapping are areas of Mussel soils in small, grassy parks and drainageways. These soils make up about 10 percent of the unit. They have a surface layer of sandy loam and are not gravelly. Also included are soils on short, steep terrace edges. These soils are mainly sand and gravel, but in some places the substratum is very gravelly or extremely gravelly loamy sand.

Permeability is moderately rapid in the Bronell soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high. The hazard of erosion on steep terrace edges is very high.

This soil is used as noncommercial woodland, for wildlife habitat, or as rangeland.

The potential plant community is mainly needleandthread, blue grama, and Scribner needlegrass and scattered areas of pinyon and juniper. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, red threeawn, pingue, pricklypear, blue grama, pinyon, and juniper increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. Many areas have a moderately dense overstory of pinyon and juniper. The use of tree spades for removal of transplants is limited by the high content of rock fragments in the soil. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production.

This soil is well suited to homesite development in areas where the slope is about 8 percent or less. Areas on steep terrace edges are poorly suited to this use.

The capability classification is VIe, nonirrigated. The soil is in the Gravelly Foothill #214 range site.

11—Bronell-Kerhayden complex, 10 to 40 percent slopes. These soils are on fan terraces that generally have been deeply dissected into hills and long, parallel ridges. The native vegetation is mainly pinyon and juniper. Elevation is 6,800 to 8,400 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 50 percent Bronell soil and 40 percent Kerhayden soil. The soils are variable because they formed in interbedded clay, silt, and layers of sand and gravel. The strata of these materials range from a few inches to many feet in thickness. They are not uniform and differ within a short distance.

Included with these soils in mapping are areas of soils that are shallow over conglomerate or compacted siltstone. These included soils are on side slopes. They make up about 5 percent of the unit. Also included are soils on steep terrace edges along the larger drainageways. These soils are mainly sand and gravel. They make up about 5 percent of the unit.

The Bronell soil is deep and well drained. It formed in alluvium. Slopes range from 10 to 40 percent. The surface layer is typically grayish brown very gravelly loam about 6 inches thick. The substratum to a depth of 60 inches or more is very gravelly sandy clay loam and extremely gravelly sandy loam. The soil is moderately alkaline throughout. A high content of accumulated calcium carbonate is below a depth of 11 inches.

Permeability is moderate in the Bronell soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

The Kerhayden soil is deep and well drained. It formed in alluvium. Slopes range from 10 to 30 percent. The surface layer is typically light reddish brown gravelly sandy loam about 8 inches thick. The upper 14 inches of the subsoil is sandy clay loam, the next 22 inches is gravelly sandy clay loam, and the lower part to a depth of 60 inches or more is extremely gravelly sandy loam. The soil is moderately alkaline.

Permeability is moderate in the Kerhayden soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

Most areas of this unit are used as noncommercial woodland, for wildlife habitat, or for livestock grazing. A few areas are used for mining of bentonite-rich earth.

The potential plant community is needleandthread, Scribner needlegrass, and blue grama and open stands of pinyon and juniper. The potential production in normal years is about 500 pounds of air-dry vegetation per acre. In many areas the pinyon and juniper have been chained. If the condition of the understory deteriorates, red threeawn, pinyon, juniper, pingue, pricklypear, and broom snakeweed increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in unchained areas of this unit. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion. Broadcast seeding can increase grass production and reduce the hazard of erosion. Suitable seeding mixtures include adapted wheatgrasses, Russian wildrye, and blue grama.

This unit is poorly suited to homesite development. It is limited mainly by the slope.

The capability classification is VIIe, nonirrigated. The unit is in the Gravelly Foothill #214 range site.

12—Bronell Variant-Wesix-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on canyonsides. The native vegetation is mainly pinyon and juniper. Elevation is 6,600 to 7,000 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 120 to 140 days.

This unit is about 60 percent Bronell Variant, 20 percent Wesix soil, and 15 percent Rock outcrop. The Bronell Variant is on steep side slopes below limestone cliffs. The Wesix soil is on the upper, convex side slopes below the cliffs. The Rock outcrop mainly occurs as vertical or nearly vertical cliffs along the canyon rims. Many areas below the cliffs are thickly covered with stones and boulders.

Included in mapping are areas of red, clayey soils that are shallow over soft shale. These soils are on canyon side slopes. They make up about 5 percent of the unit.

The Bronell Variant is deep and well drained. It formed in colluvium derived from limestone. Slopes range from 30 to 60 percent. The surface layer is typically grayish brown very stony loam about 3 inches thick. The subsoil to a depth of 60 inches or more is very cobbly loam. The soil is moderately alkaline.

Permeability is moderate in the Bronell Variant. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is very high.

The Wesix soil is shallow and well drained. It formed in residuum derived from limestone. Slopes range from 30 to 50 percent. The surface layer is typically brown very channery loam about 3 inches thick. The substratum is very channery loam about 10 inches thick. Limestone bedrock is at a depth of about 13 inches. The soil is moderately alkaline.

Permeability is moderate in the Wesix soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of limestone. It occurs as vertical or nearly vertical cliffs about 45 to 80 feet high.

This unit is used mainly for wildlife habitat. It also is used for livestock grazing in canyon bottoms and on adjacent foot slopes.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, sideoats grama, true mountainmahogany, Scribner needlegrass, and Indian ricegrass. The potential production of native understory vegetation in normal years is about 75 pounds of air-dry vegetation per acre in most areas. Production is about 200 pounds per acre on the upper side slopes. If the condition of the understory deteriorates, blue grama, red threeawn, yucca, and pricklypear increase.

Woodland products, such as firewood and pinyon nuts, are produced in areas of this unit, but the slope severely limits access to these products. Stocking rates vary considerably.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Bronell Variant and the Wesix soil are in the Pinyon-Juniper woodland site.

13—Bundo very cobbly sandy loam, 30 to 60 percent slopes. This deep, well drained soil is on mountainsides that have a northerly aspect. It formed in colluvium derived dominantly from igneous rock, mainly andesite and rhyolite. The native vegetation is mainly conifers. Elevation is 9,500 to 11,500 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

The surface is typically covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer and subsurface layer are very cobbly sandy loam about 27 inches thick. The subsoil to a depth of 60 inches or more is very cobbly sandy clay loam. The soil is slightly acid to a depth of 18 inches and is moderately acid below that depth. In some areas the accumulated clay in the subsoil is confined to thin lamellae or small pockets. In many places the surface layer is gravelly sandy loam or very gravelly loam. In some places the surface layer is very cobbly loam.

Included with this soil in mapping are areas of Larand soils on the upper side slopes and ridges. These soils have a surface layer of very gravelly fine sandy loam. They make up about 15 percent of the unit. They have a clayey subsoil at a shallower depth than the Bundo soil and have a sandier, more permeable substratum. Also included are areas of Whiteman soils on ridges. These soils have a surface layer of cobbly loam. They are shallow and support bristlecone pine. They make up about 5 percent of the unit. Also included are small areas of rock outcrop and rubble land on very steep side slopes.

Permeability is moderate in the Bundo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly Engelmann spruce and some limber pine and lodgepole pine. Some of the lower areas support Douglas-fir. Most areas have a sparse understory of elk sedge, Kentucky bluegrass, common juniper, kinnikinnick, and snowberry. Along logging trails and in the less sloping areas that have been thinned, the understory is a moderately dense stand of elk sedge, lupine, common juniper, kinnikinnick, and Kentucky bluegrass.

This soil is suited to production of Engelmann spruce. The site index for Engelmann spruce is generally about 30. Harvesting some of the mature trees for sawtimber and thinning dense stands of the younger trees for use as poles increase the growth rate of the rest of the stand and increase the understory vegetation.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees. Generally, the hazard of erosion is slight or moderate on well designed roads and in minimally disturbed areas.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is expected to be about 25 to 50 percent but may be less than 25 percent on some slopes. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is poorly suited to homesite development.

The main limitations are the slope and the high content of cobbles.

The capability classification is VIIs, nonirrigated. The soil is in the Spruce-Fir woodland site.

14—Bushvalley cobbly loam, 5 to 40 percent slopes. This shallow, well drained soil is on hills, mesas, and mountainsides. It formed in residuum derived from breccia and tuff. The native vegetation is mainly grasses and shrubs. Elevation is 8,000 to 9,200 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically dark grayish brown cobbly loam about 4 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. Breccia is at a depth of about 11 inches. The soil is neutral. In some areas the surface layer is very cobbly loam or very stony loam.

Included in mapping are areas of soils that are similar to the Bushvalley soil but are moderately deep. These soils are on foot slopes. They make up about 10 percent of the unit. Also included are areas of rock outcrop in the steeper areas and Adderton loam in drainageways. Rock outcrop makes up about 5 percent of the unit. Adderton soils are deep. They make up about 5 percent of the unit.

Permeability is moderately slow in the Bushvalley soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland or for wildlife habitat.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, prairie junegrass, and needlegrass. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, blue grama, true mountainmahogany, Gambel oak, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition. Mechanical range seeding may be impractical in the steeper areas.

Most areas of this soil are poorly suited to homesite development. The main limitations are the slope and the depth to bedrock. Areas that have slopes of less than 15 percent are suited to homesite development if the depth to hard bedrock is more than 20 inches.

The capability classification is VIIe, nonirrigated. The soil is in the Shallow Loam #230 range site.

15—Bushvalley-Whiteman cobbly loams, 15 to 50 percent slopes. These soils are on ridges and mountainsides. The native vegetation is mainly grasses and ponderosa pine or bristlecone pine. Elevation is 8,400 to 10,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

This unit is about 65 percent Bushvalley soil and 20 percent Whiteman soil. The Bushvalley soil is in grassy areas, and the Whiteman soil is in areas that have an overstory of ponderosa pine or bristlecone pine.

Included in mapping are areas of Tellura soils on foot slopes and in drainageways. These soils have a surface layer of gravelly clay loam. They are deep. They make up about 10 percent of the unit. Also included are areas of rock outcrop on ridges and the upper part of side slopes. These areas make up about 5 percent of the unit. Also included are some small areas of Larand soils in the steeper areas. These soils are deep. They have a surface layer of very gravelly fine sandy loam. They support an overstory of bristlecone pine.

The Bushvalley soil is shallow and well drained. It formed in residuum derived dominantly from andesite, tuff, breccia, rhyolite, and granite. Slopes range from 15 to 50 percent. The surface layer is typically dark grayish brown cobbly loam about 3 inches thick. The subsoil is very cobbly clay loam about 9 inches thick. Hard tuff is at a depth of about 12 inches. The soil is neutral to a depth of 7 inches and is mildly alkaline below that depth. In some areas the surface layer is very stony loam or very cobbly loam.

Permeability is moderately slow in the Bushvalley soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Whiteman soil is shallow and well drained. It formed in residuum derived dominantly from andesite, tuff, breccia, and rhyolite. Slopes range from 15 to 30 percent. The surface layer is typically dark grayish brown cobbly loam about 2 inches thick. The subsoil is about 4 inches of very gravelly loam over 5 inches of very gravelly sandy clay loam. Tuff is at a depth of about 11 inches. The soil is neutral.

Permeability is moderate in the Whiteman soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland, for recreation, or for wildlife habitat.

The potential plant community on the Bushvalley soil is mainly Arizona fescue, mountain muhly, Parry oatgrass, prairie junegrass, and needlegrass. Many areas also have scattered stands of ponderosa pine or bristlecone pine. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, blue grama, true mountainmahogany, Gambel oak, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition. Broadcast seeding generally is necessary because of the slope.

The potential plant community on the Whiteman soil is mainly ponderosa pine or bristlecone pine and an understory of Arizona fescue, mountain muhly, and prairie junegrass. The potential production of native understory vegetation on the Whiteman soil is about 400 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, needlegrass, and Gambel oak increase.

This unit is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope.

The capability classification is VIIe, nonirrigated. The unit is about 80 percent in the Shallow Loam #230 range site and 20 percent in the Ponderosa Pine woodland site.

16—Cascajo very gravelly sandy loam, 10 to 40 percent slopes. This deep, excessively drained soil is on edges of stream terraces that are deeply dissected by drainageways. It formed in gravelly and sandy alluvium. The native vegetation is mainly grasses. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically very dark grayish brown very gravelly sandy loam about 6 inches thick. The upper 15 inches of the substratum is extremely cobbly sandy loam. The lower part to a depth of 60 inches or more is extremely cobbly sand. The soil has a high content of secondary calcium carbonate between depths of 6 and 21 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of Midway and Shingle soils on steep side slopes. Midway soils have a surface layer of stony clay loam. They make up about 10 percent of the unit. They are shallow over shale. Shingle soils have a surface layer of very stony fine sandy loam. They make up about 5 percent of the unit. They are shallow over sandstone. Also included are areas of the deep Kim soils in drainageways. These soils have a surface layer of loam. They make up about 5 percent of the unit.

Permeability is moderately rapid or rapid in the Cascajo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland.

The potential plant community is mainly sideoats grama, blue grama, little bluestem, Indian ricegrass, and needleandthread. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, ring muhly, and pricklypear increase.

Range seeding is generally difficult. The main limitations are the slope, the high content of gravel in the surface layer, and the low available water capacity. Broadcast seeding generally is necessary.

This soil is poorly suited to homesite development. It is limited mainly by the slope. It is poorly suited to use as a site for septic tank absorption fields because of a poor filtering capacity.

The capability classification is VIIs, nonirrigated. The soil is in the Gravel Breaks #64 range site.

17—Cascajo Variant gravelly sandy loam, 5 to 12 percent slopes. This deep, somewhat excessively drained soil is on fans. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 6,600 to 7,000 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 44 to 46 degrees F, and the average frost-free period is 100 to 115 days.

The surface layer is typically brown gravelly sandy loam about 6 inches thick. The subsurface layer is very gravelly loamy sand about 25 inches thick. The upper 19 inches of the substratum is very gravelly loamy fine sand. The lower part to a depth of 60 inches or more is very gravelly sand. The soil is mildly alkaline.

Included with this soil in mapping are areas of soils on the terraces of the lower Bernard Creek, north of Cotopaxi. These soils have buried layers of peat at varying depths. Most of these layers are about 5 to 10 inches thick. The soils were formerly somewhat poorly drained in some areas. The water table has been lowered many feet by significant deepening of the creek channel in recent years. The buried peat layers have dried out and caused significant subsidence of the overlying soil layers. Additional subsidence could occur.

Permeability is rapid in the Cascajo Variant. Available water capacity is very low or low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly blue grama, needleandthread, Indian ricegrass, and sand dropseed. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, sand dropseed, blue grama, red threeawn, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development. Because the rapid permeability of the soil creates a significant hazard of contamination, an alternative to septic tank absorption fields may be necessary in areas near the Arkansas River and its tributaries. In a few areas along Bernard Creek, the soil is poorly suited to homesite development because of subsidence.

The capability classification is VIs, nonirrigated. The soil is in the Sandy Foothill #210 range site.

18—Casvare-Teaspoon complex, 20 to 50 percent slopes. These soils are on mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 7,500 to 8,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 45 percent Casvare soil and 35 percent Teaspoon soil. The Casvare soil is on mainly south- and east-facing side slopes, and the Teaspoon soil is on mainly north- and west-facing side slopes.

Included with these soils in mapping are areas of Bronell and Kerhayden soils on foot slopes and along drainageways. These included soils have a surface layer of gravelly sandy loam. They are deep. Bronell soils make up about 10 percent of the unit, and Kerhayden soils make up about 5 percent. Also included are areas of Larand soils along drainageways. Larand soils have a surface layer of cobbly sandy loam. They are deep and support fir and aspen. They make up about 5 percent of the unit.

The Casvare soil is shallow and well drained. It formed in residuum derived dominantly from granite, granodiorite, gneiss, and gneissic metasedimentary rock. The surface layer is typically 3 inches of brown very stony loam over 3 inches of grayish brown very gravelly loam. The subsoil is extremely gravelly sandy loam about 11 inches thick over 7 inches of soft metasedimentary rock. Hard metasedimentary rock is at a depth of about 24 inches. The soil is mildly alkaline to a depth of 10 inches and is moderately alkaline and calcareous below that depth. In some areas the surface layer is very gravelly sandy loam or very gravelly loam.

Permeability is moderate or moderately rapid in the Casvare soil. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Teaspoon soil is shallow and well drained. It formed in residuum derived dominantly from granite, gneiss, and gneissic metasedimentary rock. The surface layer is typically dark grayish brown very gravelly sandy loam about 3 inches thick. The subsoil is extremely gravelly sandy clay loam about 8 inches thick. Hard, fractured metasedimentary rock is at a depth of about 11 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam or very gravelly loam.

Permeability is moderate in the Teaspoon soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used as noncommercial woodland, for wildlife habitat, or for livestock grazing. Livestock grazing is limited mainly to foot slopes and drainageways because of the slope.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and true mountainmahogany. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre. Understory vegetation is generally very sparse on north-facing slopes. If the condition of the understory deteriorates, blue grama, red threeawn, and forbs and shrubs increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in the other areas. The use of tree spades for removal of transplants is severely limited by the depth to bedrock and the high content of rock fragments in the soil. The average site index for mixed pinyon and juniper is about 40.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion. The hazard of erosion is moderate on well designed roads and in minimally disturbed areas.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The unit is in the Pinyon-Juniper woodland site.

19—Cathedral-Rock outcrop complex, 45 to 80 percent slopes. This map unit is on side slopes and ridges of mountainsides. The native vegetation is mainly shrubs and grasses and scattered pinyon and juniper. Elevation is 6,800 to 7,700 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 75 percent Cathedral soil and 15 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of soils that are similar to the Cathedral soil but are moderately deep. These areas make up about 5 percent of the unit. Also included are areas of Tecolote soils on foot slopes and in drainageways. These soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit. Small areas of talus are commonly below the Rock outcrop.

The Cathedral soil is shallow and well drained. It formed in colluvium and residuum derived dominantly from gneiss. Slopes range from 45 to 65 percent. The surface layer is typically grayish brown very gravelly coarse sandy loam about 6 inches thick. Below this is a layer of dark grayish brown extremely gravelly sandy loam about 9 inches thick. The substratum is extremely gravelly sandy loam about 4 inches thick. Gneiss is at a depth of about 19 inches. The soil is neutral to a depth of 15 inches and is slightly acid below that depth. In some areas the surface layer is very cobbly sandy loam or very stony sandy loam.

Permeability is rapid in the Cathedral soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of gneiss. It occurs as short, narrow cliffs and ledges and low knobs. Slopes range from 50 to 80 percent.

This unit is used mainly for wildlife habitat or as watershed. It also is used for livestock grazing, although many areas are inaccessible. Livestock have limited access to the lower side slopes, and grazing is limited mainly to foot slopes and drainageways.

The potential plant community is mainly scattered pinyon and juniper and an understory of Scribner needlegrass, blue grama, true mountainmahogany, western wheatgrass, Gambel oak, and Indian ricegrass. The potential production of native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. The vegetation in most areas is mainly Gambel oak, true mountainmahogany, and Scribner needlegrass. The density of pinyon and juniper stands is variable. Pinyon and juniper have limited economic value. Generally, only areas on foot slopes and ridges are accessible. The slope limits harvesting in the other areas.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The Cathedral soil is in the Pinyon-Juniper woodland site.

20—Cerrillos gravelly sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on fans and fan terraces. It formed in alluvium derived dominantly from red sandstone. The native vegetation is mainly grasses. Elevation is 6,000 to 6,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically reddish brown gravelly sandy loam about 10 inches thick. The subsoil is reddish brown sandy clay loam about 21 inches thick. The upper 8 inches of the substratum is reddish brown gravelly sandy loam. The lower part to a depth of 72 inches or more is reddish brown silt loam. The soil is mildly alkaline to a depth of 19 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Sedillo soils adjacent to drainageways. These soils have a surface layer of cobbly sandy loam. They make up about 5 percent of the unit. They have a high content of pebbles and cobbles.

Permeability is moderate in the Cerrillos soil. Available water capacity also is moderate. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas of this soil are used as rangeland. A few areas are used for irrigated hay or pasture.

The potential plant community is mainly western wheatgrass, blue grama, needleandthread, prairie junegrass, and little bluestem. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, and broom snakeweed increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to hay and pasture. Important management concerns include the effective use of water, the maintenance of soil fertility, and measures that help to control erosion.

Irrigation water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. The water can be applied by flooding from contour ditches, by sprinklers, or by corrugation. Leveling helps to ensure the uniform application of water. The seedbed should be prepared on the contour or across the slope where practical. Corrugations or furrows should also be on the contour or across the slope.

Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. The addition of green manure or barnyard manure also improves soil fertility and tilth. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. If properly managed, this soil can produce 4 tons of irrigated alfalfa hay per acre.

This unit is well suited to homesite development.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The unit is in the Loamy Foothill #202 range site.

21—Chittum sandy loam, dry, 5 to 20 percent slopes. This shallow, well drained soil is on low hills and ridges. It formed in residuum derived dominantly from red sandstone. The native vegetation is mainly grasses. Elevation is 8,600 to 9,600 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically reddish brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 6 inches thick. Sandstone is at a depth of about 10 inches. The soil is neutral.

Included with this soil in mapping are areas of rock outcrop on ridges and the upper side slopes. These areas make up about 10 percent of the unit. Rock outcrop occurs as long, narrow striations and some ledges about 1 to 10 feet high. Small areas of soils near the rock outcrop have a channery surface layer. Also included are areas of loamy soils in narrow drainageways. These soils are moderately deep and deep. They make up about 5 percent of the unit. Approximately 250 acres in sec. 11 and sec. 12, T. 5 N., R. 10 E., includes brown, gravelly soils that formed in material weathered from tuff.

Permeability is moderate in the Chittum soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, prairie junegrass, western wheatgrass, and Indian ricegrass. The potential production of native understory vegetation in normal years is about 700 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, slimstem muhly, blue grama, fringed sagebrush, and rabbitbrush increase. Controlling livestock grazing helps to protect the soil from excessive erosion. Range seeding is suitable, but broadcast seeding generally is necessary because of the depth to bedrock and the areas of rock outcrop.

This soil is poorly suited to homesite development. It is limited mainly by the depth to bedrock. In some areas it is also limited by the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Dry Shallow Loam #232 range site.

22—Coaldale very gravelly sandy loam, 20 to 45 percent slopes. This shallow, well drained soil is on mountainsides. It formed in residuum derived dominantly from granite and gneiss. The native vegetation is mainly pinyon and juniper. Elevation is 6,700 to 7,700 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 85 to 105 days.

The surface layer is typically brown very gravelly sandy loam about 3 inches thick. The upper 7 inches of the subsoil is very gravelly sandy clay loam, and the lower 8 inches is very gravelly sandy loam. Granodiorite bedrock is at a depth of about 18 inches. The soil is neutral to a depth of 10 inches and is moderately alkaline below that depth. In some areas the surface layer is very cobbly sandy loam.

Included with this soil in mapping are areas of Bronell soils in narrow drainageways and on foot slopes. These soils have a surface layer of gravelly sandy loam. They are deep. They make up about 5 percent of the unit. Also included are areas of granite or gneiss rock outcrop on the upper part of side slopes and ridges. These areas make up about 5 percent of the unit.

Permeability is moderate in the Coaldale soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as noncommercial woodland, for wildlife habitat, or for recreation. Livestock grazing is limited by a cover of pinyon and juniper, a sparse understory, and the slope.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and mountainmahogany. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, walkingstick cholla, pricklypear, and rabbitbrush increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production. Suitable seeding mixtures include adapted wheatgrasses, Russian wildrye, and blue grama.

Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

23—Cochetopa clay loam, 2 to 6 percent slopes. This deep, well drained soil is on fans and in swales. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 8,000 to 8,800 feet. The average annual precipitation is 17 to 20 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 50 to 85 days.

The surface layer is typically dark grayish brown clay loam about 5 inches thick. The subsoil is clay loam about 27 inches thick. The underlying material to a depth of 60 inches or more is clay loam. The soil is neutral to a depth of 32 inches and is mildly alkaline below that depth.

Included with this soil in mapping are areas of Youga soils on the toe slopes of adjacent side slopes. These soils have a surface layer of sandy loam. They make up about 5 percent of the unit. They have less clay in the subsoil than the Cochetopa soil.

Permeability is slow in the Cochetopa soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight to high.

This soil is used as rangeland. Most areas were formerly used for potatoes or hay but have been reseeded to adapted grasses.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, western wheatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, western wheatgrass, blue grama, bottlebrush squirreltail, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for homesite development, the main limitations are a high shrink-swell potential and the slow permeability. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the slow permeability. Other types of sewage disposal systems may be needed.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

24—Corpening gravelly loam, 5 to 25 percent slopes. This shallow, well drained soil is on ridges and hills. It formed in residuum derived dominantly from gneiss and granite. The native vegetation is mainly grasses. Elevation is 7,500 to 7,900 feet. The average annual precipitation is 15 or 16 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 75 to 95 days.

The surface layer is typically about 10 inches of dark grayish brown gravelly loam over 2 inches of pale brown gravelly loam. Gneiss is at a depth of about 12 inches. The soil is moderately alkaline.

Included with this soil in mapping are Cathedral soils in the steeper areas. These soils have a surface layer of very gravelly coarse sandy loam. They make up about 10 percent of the unit. They have a higher content of gravel than the Corpening soil. Also included are areas of Jodero soils in drainageways and areas of rock outcrop on ridges and hilltops. Jodero soils have a surface layer of sandy loam. They are deep. They make up about 5 percent of the unit. The areas of rock outcrop also make up about 5 percent of the unit.

Permeability is moderate in the Corpening soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly sideoats grama, blue grama, needleandthread, and little bluestem. The average annual production of air-dry vegetation is about 450 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, broom snakeweed, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

This soil is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope. The slope is not a severe limitation in areas where it is less than about 15 percent.

The capability classification is VIIe, nonirrigated. The soil is in the Shallow Foothill #204 range site.

25—Cryoborolls, 15 to 35 percent slopes. These deep, well drained soils are on foot slopes and in swales in high, mountainous areas. They formed in colluvium and alluvium derived from igneous rocks, mainly andesite and rhyolite. The native vegetation is mainly aspen. Elevation is 9,600 to 11,000 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

The texture of the soils is variable, but the surface layer is commonly dark gray gravelly loam about 3 inches thick. The subsurface layer is very gravelly fine sandy loam about 19 inches thick. The subsoil is about 15 inches of very gravelly sandy clay loam over 17 inches of very cobbly sandy loam. The substratum to a depth of 60 inches or more is very cobbly loamy sand. The soils are neutral. In some areas the surface layer is very cobbly loam or very stony loam. In other areas the content of rock fragments is low.

Included with these soils in mapping are areas of Larand soils in the steeper areas. These included soils have a surface layer of very gravelly fine sandy loam. They make up about 10 percent of the unit.

Permeability is moderate or moderately rapid in the Cryoborolls. Available water capacity is low to high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

These soils are used as woodland, for wildlife habitat, for recreation, or for summer livestock grazing. They are well suited to livestock grazing in the summer.

The potential plant community is mainly quaking aspen and some limber pine, Douglas-fir, and Engelmann spruce and an understory of sedges, Kentucky bluegrass, common juniper, Parry oatgrass, and nodding bromegrass. The grassy understory is generally thick, especially in small parks. The potential production of native understory vegetation in normal years is about 700 pounds of air-dry vegetation per acre. Forage production is variable, depending primarily on the age and density of the aspen stand. If the condition of the understory deteriorates, Kentucky bluegrass, sedges, and Arizona fescue increase.

Cutting the larger aspen stimulates reproduction and extends the life and productivity of the stand. Periodic thinning also enhances understory forage for grazing by livestock and wildlife. Cutting and periodic thinning provide woodland products, such as firewood, poles, and some sawtimber.

These soils are suited to production of quaking aspen. The site index is about 70. The soils are better suited to grazing, however, than to production of aspen. Allowing grazing in areas of these soils minimizes the hazard of erosion and helps to maintain the forage yields of the watershed resource.

These soils are poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. The soils are in the Aspen woodland site.

26—Cumulic Cryaquolls, 2 to 5 percent slopes. These deep, very poorly drained soils are on stream terraces. They formed in alluvium. The native vegetation is mainly grasses and sedges. Elevation is 7,800 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

These soils are variable, but a profile commonly observed in the survey area has a surface layer of gray, stratified clay loam, silty clay loam, and sandy clay loam about 25 inches thick. The underlying material to a depth of 60 inches or more is stratified sandy clay loam, silty clay loam, and clay loam. The soils are moderately alkaline to a depth of 25 inches. They are mildly alkaline to a depth of 30 inches and are neutral below that depth. In some areas the soils are very gravelly. In other areas sand and gravel are in the lower part of the underlying material.

Included in mapping are areas of the well drained Adderton soils. These soils are on the edges of stream terraces. They make up about 5 percent of the unit.

Permeability is moderately slow or moderate in the Cumulic Cryaquolls. Available water capacity is low to high. Effective rooting depth is limited by a seasonal high water table at the surface to a depth of 1.5 feet from April through June. The soils are subject to brief, occasional periods of flooding in spring and early summer. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

These soils are used for irrigated and naturally subirrigated hay and pasture. The choice of crops is limited mainly to grasses because of the limited rooting depth and the short growing season.

The potential plant community is mainly tufted hairgrass, sedges, and slender wheatgrass. The average annual production of air-dry vegetation is about 3,000 pounds per acre. If the condition of the range deteriorates, Baltic rush and sedges increase. Range seeding is suitable if the range is in poor condition. Applications of nitrogen fertilizer promote the growth of forage plants. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff.

If properly managed, these soils can produce 1.5 tons of irrigated grass hay per acre. Proper grazing practices, weed control, and applications of fertilizer are needed to ensure maximum quality of forage. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill.

These soils are poorly suited to homesite development. The main limitations are the wetness and the hazard of flooding.

The capability classification is Vw, irrigated and nonirrigated. The soils are in the Mountain Meadow #241 range site.

27—Curecanti gravelly sandy loam, 4 to 10 percent slopes. This deep, well drained soil is on fans and fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 7,300 to 8,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 44 to 46 degrees F, and the average frost-free period is 80 to 100 days.

The surface layer is typically dark brown gravelly sandy loam about 10 inches thick. The subsoil is very cobbly clay loam about 18 inches thick. The substratum to a depth of 60 inches or more is extremely cobbly sandy loam. The soil is neutral to a depth of 28 inches and is mildly alkaline below that depth. Some areas have a thick cover of cobbles and stones on the surface. The cobbles and stones are in stringers about 10 to 50 feet wide. They make up about 30 percent of the unit.

Permeability is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, western wheatgrass, and muttongrass. The average annual production of air-dry vegetation is about 850 pounds per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, yucca, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition. Broadcast seeding may be needed in areas that have stones and cobbles on the surface.

This soil is suited to homesite development. Because of the high content of rock fragments, however, excavation for foundations and utilities is difficult.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Glacial Outwash #291 range site.

28—Curecanti very cobbly sandy loam, 15 to 45 percent slopes. This deep, well drained soil is on fan terraces. It formed in mixed alluvium. The native vegetation is mainly grasses. Elevation is 7,500 to 8,700 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 44 to 46 degrees F, and the average frost-free period is 75 to 100 days.

The surface layer is typically dark brown very cobbly sandy loam about 6 inches thick. The subsoil is very cobbly sandy clay loam about 14 inches thick. The substratum to a depth of 60 inches or more is very cobbly sandy loam. The soil is neutral. In some areas the substratum is densely packed. In other areas the content of hard rock fragments in the substratum is less than 35 percent.

Included with this soil in mapping are areas of Tecolote soils adjacent to drainageways on northwest-facing side slopes. These soils have a surface layer of very gravelly sandy loam. They make up about 10 percent of the unit. They do not have a thick, dark surface layer. They support an open to moderately dense stand of ponderosa pine and a dense stand of Gambel oak. Also included are a few areas of soils that are shallow over conglomerate. These areas are about 6 to 50 feet in diameter. In sec. 23, T. 20 S., R. 70 W., soils that have a stony surface and a low content of rock fragments are included.

Permeability is moderate in the Curecanti soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, western wheatgrass, and muttongrass. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is poorly suited to homesite development. The main limitation is the slope. Also, the high content of large stones and cobbles makes excavating the site and installing utilities and foundations somewhat difficult.

The capability classification is VIIe, nonirrigated. The soil is in the Loamy Glacial Outwash #291 range site.

29—Curecanti Variant extremely cobbly loam, 8 to 20 percent slopes, very stony. This deep, well drained soil is on mesas and cuestas. It formed in alluvium derived dominantly from sandstone. The native vegetation is mainly pinyon and juniper. Elevation is 6,800 to 7,300 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 105 to 115 days.

Typically, about 1 to 3 percent of the surface is covered with stones. The surface layer is dark gray extremely cobbly loam about 8 inches thick. The subsoil is about 10 inches of very cobbly clay over 32 inches of very cobbly clay loam. Sandstone is at a depth of about 50 inches. The soil is slightly acid to a depth of 8 inches. It is neutral to a depth of 18 inches and is moderately alkaline below that depth. Below a depth of

18 inches, the subsoil has a high content of calcium carbonate.

Included with this soil in mapping are areas of Nunn soils in open, grassy areas. These soils have a surface layer of stony loam and have a low content of rock fragments. They are deep. They make up about 5 percent of the unit. Also included are areas of soils that are similar to the Curecanti Variant but are moderately deep. These soils are near cliffs bordering the pediments. They make up about 5 percent of the unit.

Permeability is slow in the Curecanti Variant. Available water capacity is low. Effective rooting depth is 40 to 70 inches. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as noncommercial woodland or as rangeland.

The potential plant community is mainly sideoats grama, big bluestem, little bluestem, and scattered areas of pinyon and juniper. The average annual production of air-dry vegetation is about 1,250 pounds per acre. If the condition of the range deteriorates, pinyon, juniper, blue grama, Gambel oak, and red threeawn increase. The dominant vegetation in some areas is Gambel oak. Most areas are covered by a moderately thick stand of pinyon and juniper.

Woodland products, such as firewood, Christmas trees, and pinyon nuts, are produced in areas of this soil, but the surface stoniness severely limits access to these products. Range seeding generally is limited to broadcast seeding because of the stoniness.

This soil is poorly suited to homesite development. It is limited mainly by the high content of large stones.

The capability classification is VIIs, nonirrigated. The soil is in the Cobbly Foothill #213 range site.

30—Dumps and Pits. This map unit consists of large piles of coal mine tailings and a few areas of pits and quarries. The groups of piles form a hilly landscape. The pits are about 10 to 40 acres in size. In sec. 16, T. 19 S., R. 70 W., ore milling wastes are stored in a large system of tailings ponds.

Most areas of this unit are barren or nearly barren.

Included in mapping are several delineations of mixed piles and nearly level fill in sec. 5 and sec. 8, T. 19 S., R. 70 W. They are in an old industrial area consisting mainly of level fill pads and piles of earth and coal mine spoil. The fill material consists mainly of thin stratifications of sandy loam, loam, and sand and thin layers of coal chips. The areas are partially revegetated with grasses and shrubs. Tall rabbitbrush is a common shrub.

Delineations of this unit are about 5 to 160 acres in size.

The capability classification is VIIIs.

31—Ess very gravelly sandy clay loam, 20 to 45 percent slopes. This deep, well drained soil is on mountainsides. It formed in colluvium. Slopes are about 200 to 900 feet long. The native vegetation is mainly grasses and shrubs. Elevation is 8,200 to 9,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically dark brown very gravelly sandy clay loam about 12 inches thick. The subsoil is very gravelly sandy clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is very gravelly sandy loam. The soil is neutral to a depth of 17 inches and is mildly alkaline below that depth.

Included with this soil in mapping are areas of Bushvalley soils on convex side slopes and in areas adjacent to rock outcrop. These soils have a surface layer of cobbly sandy loam. They are shallow. They make up about 10 percent of the unit. Also included are areas of rock outcrop and talus. These areas make up about 5 percent of the unit. Rock outcrop mainly occurs as long, narrow cliffs of tuff and ash flows. Also included are small areas of Ess soils that have a surface layer of extremely stony loam and that have some boulders on the surface.

Permeability is moderate or moderately slow in the Ess soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland or for wildlife habitat. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly mountain muhly, bottlebrush squirreltail, needleandthread, nodding bromegrass, true mountainmahogany, and Gambel oak. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, needlegrass, cheatgrass, rabbitbrush, bottlebrush squirreltail, and broom snakeweed increase.

This soil is poorly suited to homesite development. It is limited mainly by the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Brushy Mountain Loam #239 range site.

32—Ess very gravelly loam, 30 to 50 percent slopes. This deep, well drained soil is on mountainsides. It formed in colluvium over residuum derived dominantly from tuff and breccia. The native vegetation is mainly grasses. Elevation is 9,300 to 11,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 38 to

42 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically dark grayish brown very gravelly loam about 14 inches thick. The upper 19 inches of the subsoil is very gravelly clay loam, and the lower 7 inches is extremely cobbly sandy clay loam. The substratum to a depth of 60 inches or more is extremely cobbly sandy loam. The soil is slightly acid to a depth of 10 inches. It is neutral to a depth of 23 inches and is mildly alkaline below that depth. In some areas the surface layer is very cobbly loam or very stony loam.

Included with this soil in mapping are areas of Bushvalley soils in the steeper areas. These soils have a surface layer of cobbly loam. They are shallow. They make up about 10 percent of the unit. Also included are small areas of tuff and breccia rock outcrop. In a few areas the substratum has a lower content of pebbles and cobbles, by volume.

Permeability is moderate or moderately slow in the Ess soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as rangeland or for wildlife habitat. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, and prairie junegrass. A few small areas, above an elevation of 10,500 feet, support Thurber fescue. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, needleandthread, blue grama, sedges, fringed sagebrush, and other shrubs increase.

This soil is poorly suited to homesite development. It is limited mainly by the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Skeletal Loam #377 range site.

33—Ess-Bushvalley complex, 10 to 45 percent slopes. These soils are on hills, mesas, fan terraces, and mountainsides. The native vegetation is mainly grasses. Elevation is 8,000 to 9,200 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

This unit is about 55 percent Ess soil and 35 percent Bushvalley soil. The Ess soil is on side slopes, and the Bushvalley soil is on ridges and steep side slopes.

Included with these soils in mapping are areas of Adderton soils on foot slopes and in drainageways. These included soils have a surface layer of loam. They are less gravelly than the Ess and Bushvalley soils. They make up about 5 percent of the unit. Also included are areas of breccia or tuff rock outcrop on the steep, upper side slopes. These areas make up about 5 percent of the unit. Small areas of Youga soils are on a few fan terraces. These soils have a surface layer of sandy loam. They have a lower content of gravel than the Ess soil.

The Ess soil is deep and well drained. It formed in colluvium derived dominantly from tuff, breccia, granite, and gneiss. The surface layer is typically dark grayish brown very gravelly loam about 14 inches thick. The upper 19 inches of the subsoil is very gravelly clay loam, and the lower 7 inches is extremely cobbly sandy clay loam. The substratum to a depth of 60 inches or more is extremely cobbly sandy loam. The soil is slightly acid to a depth of 10 inches. It is neutral to a depth of 23 inches and is mildly alkaline below that depth. In some areas the surface layer is very stony loam, very cobbly loam, or very gravelly sandy loam. In sec. 10, sec. 11, sec. 14, and sec. 15, T. 16 S., R. 71 W., the soil is commonly calcareous below a depth of about 3 feet. These areas are commonly known as the Bare Hills.

Permeability is moderate or moderately slow in the Ess soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

The Bushvalley soil is shallow and well drained. It formed in residuum derived dominantly from tuff, breccia, granite, and gneiss. The surface layer is typically dark grayish brown cobbly loam about 4 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. Breccia is at a depth of about 11 inches. The soil is neutral.

Permeability is moderately slow in the Bushvalley soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,000 pounds per acre in areas of the Ess soil and about 700 pounds in areas of the Bushvalley soil. If the condition of the range deteriorates, blue grama, fringed sagebrush, and woody shrubs increase. Range seeding is suitable if the range is in poor condition. Mechanical treatment is difficult in some areas because of surface stoniness and the slope.

Most areas of this map unit are poorly suited to homesite development. The main limitations are the slope and the depth to bedrock. The depth to bedrock is a limitation on many of the ridges and steep side slopes.

The capability classification is VIIe, nonirrigated. The unit is about 60 percent in the Skeletal Loam #377 range site and 40 percent in the Shallow Loam #230 range site.

34—Fort Collins loam, 1 to 4 percent slopes. This deep, well drained soil is on plains and fan terraces. It formed in medium textured alluvium. The native vegetation is mainly grasses. Elevation is 5,100 to 5,600 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 170 days.

The surface layer is typically pale brown loam about 4 inches thick. The subsoil to a depth of 60 inches or more is loam. The soil is neutral to a depth of 15 inches. It is mildly alkaline to a depth of 21 inches and is moderately alkaline below that depth.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland or for hay and pasture. Small areas in Lincoln Park are used for vegetables or for fruit orchards.

The potential plant community is mainly blue grama, western wheatgrass, and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. The irrigation water can be applied by furrow, corrugation, flooding from contour ditches, or sprinklers. It should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 6.0 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIe, irrigated, and VIc, nonirrigated. The soil is in the Loamy Plains #6 range site.

35—Fort Collins loam, cool, 0 to 2 percent slopes. This deep, well drained soil is on fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,600 to 6,300 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 49 to 52 degrees F, and the average frost-free period is 130 to 160 days.

The surface layer is typically brown loam about 4 inches thick. The upper part of the subsoil is clay loam about 17 inches thick. The lower part of the subsoil and the substratum to a depth of 60 inches or more are loam. The soil is neutral to a depth of 4 inches. It is mildly alkaline to a depth of 16 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Nunn soils. These soils have a surface layer of clay loam and have more clay in the subsoil than the Fort Collins soil. They make up about 5 percent of the unit.

Permeability is moderate in the Fort Collins soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this soil are used as rangeland. A few areas are used for irrigated hay and pasture. A few small areas were formerly used as cropland but have been replanted to grass.

The potential plant community is mainly western wheatgrass, blue grama, little bluestem, and needleandthread. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, pricklypear, walkingstick cholla, and tall rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. Irrigation water can be applied by furrow, corrugation, flooding from contour ditches, or sprinklers. The water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 5.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

36—Fort Collins loam, cool, 2 to 5 percent slopes. This deep, well drained soil is on fan terraces and fans. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,300 to 6,600 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 49 to 52 degrees F, and the average frost-free period is 130 to 160 days.

The surface layer is typically grayish brown loam about 4 inches thick. The upper part of the subsoil is mainly clay loam about 17 inches thick. The lower part of the subsoil and the substratum to a depth of 60 inches or more are loam. The soil is neutral to a depth of 4 inches. It is mildly alkaline to a depth of 16 inches and is moderately alkaline below that depth.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as rangeland. A few small areas were formerly used as cropland but are now planted to grass.

The potential plant community is mainly western wheatgrass, blue grama, needleandthread, and little bluestem. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, pricklypear, and broom snakeweed increase.

This soil is well suited to homesite development.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

37—Fort Collins Variant loam, 3 to 8 percent slopes. This deep, well drained soil is on fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 7,000 to 7,400 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 44 to 47 degrees F, and the average frost-free period is 100 to 120 days.

The surface layer is typically brown loam about 4 inches thick. The upper 5 inches of the subsoil is clay loam. The lower part of the subsoil to a depth of 60 inches or more is loam. The soil is neutral to a depth of 9 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Jodero soils in narrow drainageways. These soils have a surface layer of sandy loam. They make up about 5 percent of the unit.

Permeability is moderate in the Fort Collins Variant. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used as rangeland.

The potential plant community is mainly western wheatgrass, blue grama, needleandthread, and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, and annual forbs increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

38—Granile very gravelly sandy loam, 4 to 25 percent slopes. This deep, well drained soil is on mountainsides. It formed in colluvium and residuum derived dominantly from granodiorite. The native vegetation is mainly conifers. Elevation is 8,500 to 10,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 45 to 65 days.

The surface is typically covered with a mat of needles and twigs about 2 inches thick. The surface layer is light brownish gray very gravelly sandy loam about 10 inches thick. The upper 12 inches of the subsoil is mainly extremely gravelly sandy clay loam, and the lower 30 inches is extremely gravelly coarse sandy loam. The substratum to a depth of 60 inches or more is extremely gravelly loamy coarse sand. The soil is neutral to a depth of 22 inches and is slightly acid below that depth.

Included with this soil in mapping are areas of Adderton soils along drainageways. These soils make up about 10 percent of the unit. They have a low content of gravel and have a thick, dark surface layer of loam. Also included are areas of Guffey soils in the steeper areas. These soils are moderately deep. They make up about 5 percent of the unit.

Permeability is moderate in the Granile soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as woodland, for wildlife habitat, or for summer livestock grazing.

The potential plant community is mainly Douglas-fir and white fir and an understory of common juniper, sedges, kinnikinnick, nodding bromegrass, and other forbs and grasses. The potential production of understory vegetation in normal years is about 100 pounds per acre. The overstory is dominantly Engelmann spruce in a few small areas at the higher elevations.

This soil is suited to production of Douglas-fir and white fir. Conventional methods for harvesting timber can be used. Based on a site index of 55, the potential production per acre of merchantable timber is 2,000 cubic feet or 7,800 board feet (International rule, ⅛-inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees. The hazard of erosion is slight on well designed roads and in minimally disturbed areas.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that the content of moisture in the soil will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is well suited to homesite development in areas where the slope is about 8 percent or less.

The capability classification is VIe, nonirrigated. The soil is in the Douglas-Fir woodland site.

39—Granile very gravelly sandy loam, 25 to 45 percent slopes. This deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived dominantly from sandstone. The native vegetation is mainly conifers. Elevation is 8,000 to 9,200 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 75 days.

The surface is typically covered with a mat of fir litter about 2 inches thick. In a few areas the surface is stony. The surface layer is dark grayish brown very gravelly sandy loam about 2 inches thick. The subsurface layer is mainly brown very gravelly sandy loam about 17 inches thick. The subsoil is extremely gravelly sandy clay loam to a depth of 60 inches or more. The soil is neutral to a depth of 2 inches. It is strongly acid to a depth of 32 inches and is slightly acid below that depth. In some areas the surface layer is very cobbly sandy loam.

Included in mapping are areas of soils that are similar to the Granile soil but are moderately deep over sandstone or siltstone. These soils make up about 10 percent of the unit. They are near ridges on the steeper, upper side slopes. Also included are areas of sandstone rock outcrop on ridges and the upper side slopes. These areas make up about 5 percent of the unit.

Permeability is moderate in the Granile soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly Douglas-fir and some white fir and a very sparse understory of common juniper, kinnikinnick, Oregongrape, and sedges. The potential production of understory vegetation in normal years is about 100 pounds per acre. A few areas of mixed aspen and fir are also in this unit.

This soil is suited to production of Douglas-fir. Harvesting some of the mature trees for sawtimber and thinning dense stands of the younger trees for use as poles increase the growth rate of the rest of the stand and increase the understory vegetation. The main management concerns are the low available water capacity and the slope. Conventional harvesting methods generally are restricted to areas where the slopes are less than 30 percent. The stoniness of the surface limits felling and yarding in some areas.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees. Generally, the hazard of erosion is moderate on well designed roads and in minimally disturbed areas.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. It is less than 25 percent on some north-facing slopes. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Douglas-Fir woodland site.

40—Granile-Guffey very gravelly sandy loams, 25 to 50 percent slopes. These soils are on mountainsides. The native vegetation is mainly conifers. Elevation is 8,600 to 9,600 feet. The average annual precipitation is 14 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 75 days.

This unit is about 50 percent Granile soil and 35 percent Guffey soil. The Granile soil is on the lower and middle side slopes, and the Guffey soil is on the upper side slopes.

Included in mapping are areas of Raleigh soils on ridges. These soils have a surface layer of stony sandy loam. They are shallow. They make up about 10 percent of the unit. Also included are areas of rock outcrop on ridges and steep side slopes. These areas make up about 5 percent of the unit.

The Granile soil is deep and well drained. It formed in colluvium and residuum derived dominantly from granodiorite. Slopes range from 25 to 50 percent. The surface is typically covered with a mat of partially decomposed fir litter about 2 inches thick. The subsurface layer is light brownish gray very gravelly sandy loam about 10 inches thick. The upper 4 inches of the subsoil is very gravelly sandy clay loam, the next 8 inches is extremely gravelly sandy clay loam, and the lower 30 inches is extremely gravelly coarse sandy loam. The substratum to a depth of 60 inches or more is extremely gravelly coarse loamy sand. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Permeability is moderate in the Granile soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

The Guffey soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from granodiorite. Slopes range from 25 to 50 percent. The surface is typically covered with a mat of partially decomposed organic matter about 1 inch thick. The surface layer is dark grayish brown very gravelly sandy loam about 2 inches thick. The subsurface layer is pale brown very gravelly sandy loam about 11 inches thick. The subsoil is extremely gravelly sandy clay loam about 10 inches thick. The substratum is extremely gravelly coarse sandy loam about 7 inches thick. Soft, fractured granodiorite bedrock is at a depth of about 30 inches. The soil is slightly acid.

Permeability is moderately rapid in the Guffey soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This unit is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly Douglas-fir and white fir and an understory of common juniper, kinnikinnick, sedges, and Oregongrape. The potential production of native understory vegetation in normal years is about 100 pounds per acre.

This unit is suited to production of woodland products. The potential productivity is moderately high. Most delineations are about 40 to 200 acres in size. Thinning the denser stands of young trees for use as poles or firewood increases the growth rate of the remaining stand. The main management concerns are the slope and the low available water capacity. Conventional harvesting methods generally are restricted to areas that have slopes of less than 30 percent. The stoniness of the surface limits felling and yarding in some areas. The hazard of erosion is slight or moderate on well designed roads and in minimally disturbed areas. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that the content of moisture in the soil will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This unit is poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. The unit is in the Douglas-Fir woodland site.

41—Haploborolls, very stony-Rock outcrop complex, 40 to 90 percent slopes. This map unit is mainly on north-facing mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 6,400 to 7,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 90 to 120 days.

This unit is about 60 percent Haploborolls and 25 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of Bronell soils on foot slopes and the bouldery Ustic Torriorthents on short, south- and east-facing side slopes. Bronell soils have a surface layer of gravelly sandy loam. They are deep. They make up about 10 percent of the unit. Ustic Torriorthents make up about 5 percent of the unit. They have a thinner, darker surface layer than the Haploborolls. Stands of pinyon and juniper in the drier areas on side slopes are more open and less productive than in other areas of the unit.

The Haploborolls are mainly shallow but are moderately deep in some areas. They are well drained to somewhat excessively drained. Typically, 1 to 2 percent of the surface is covered with stones that are about 10 to 20 feet apart. These soils formed in residuum and colluvium derived dominantly from gneiss and granite. Slopes range from 40 to 70 percent. These soils are variable, but a profile commonly observed in the survey area has a surface layer of dark grayish brown extremely gravelly sandy loam about 2 inches thick over a layer of very gravelly sandy loam about 5 inches thick. The substratum is very gravelly sandy loam about 5 inches thick. Well decomposed gneiss is at a depth of about 12 inches. Hard gneiss is at a depth of about 21 inches. The soils are slightly acid to a depth of 2 inches and are neutral below that depth.

Permeability is moderately rapid or rapid in the Haploborolls. Available water capacity is very low. Effective rooting depth is 4 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Rock outcrop consists mainly of gneiss and granite. It occurs as short cliffs and ledges and low knobs. Slopes range from 50 to 90 percent. The Rock outcrop occurs throughout the unit but is most common on ridges and the upper part of side slopes.

This unit is used for wildlife habitat, watershed, or recreation. The slope, the Rock outcrop, and boulders on the surface limit access to most areas by livestock.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, mountainmahogany, blue grama, and Indian ricegrass. If the condition of the understory deteriorates, blue grama, red threeawn, pricklypear, yucca, and other forbs and shrubs increase. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit, but the slope and the stony, rugged terrain severely limit access to these products. The site index for pinyon and juniper ranges from 35 to 55.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Haploborolls are in the Pinyon-Juniper woodland site.

42—Heath cobbly loam, 5 to 30 percent slopes. This deep, well drained soil is on hills. It formed in alluvium and residuum derived dominantly from arkosic conglomerate. The native vegetation is mainly grasses. Elevation is 8,200 to 9,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

The surface layer is typically dark grayish brown cobbly loam about 7 inches thick. The subsoil is clay about 41 inches thick. The substratum to a depth of 60 inches or more is clay. The soil is slightly acid to a depth of 7 inches. It is neutral to a depth of 27 inches and is moderately alkaline below that depth.

Included in mapping are areas of soils that are similar to the Heath soil but are moderately deep. These soils make up about 10 percent of the unit. They are on the upper side slopes and near areas of rock outcrop. Also included are areas of rock outcrop on the upper side slopes. These areas make up about 5 percent of the unit. Also included are some areas of soils that have a stony surface layer.

Permeability is very slow in the Heath soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to very rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, western wheatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. A few areas have open stands of ponderosa pine or Gambel oak. If the condition of the range deteriorates, blue grama, slimstem muhly, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition, but in some areas broadcast seeding is necessary because of surface stoniness.

If this soil is used for homesite development, the main limitations are a high shrink-swell potential and the very slow permeability. The slope is a severe limitation in areas where it is more than about 15 percent. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

43—Herakle-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on mountainsides and hogbacks. The native vegetation is mainly conifers. Elevation is 9,000 to 9,400 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

This unit is about 65 percent Herakle soil and 20 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of Lakehelen soils on the lower side slopes and foot slopes. These moderately deep soils have a surface layer of very stony fine sandy loam. They make up about 10 percent of the unit. Also included are areas of Rentsac Variant soils in small, grassy parks. These soils have a thick, dark surface layer of channery loam. They make up about 5 percent of the unit.

The Herakle soil is shallow and well drained. It formed in residuum derived from limestone. The surface layer is typically brown very channery loam about 2 inches thick. The subsurface layer is brown very channery loam about 5 inches thick. The upper part of the subsoil is very channery clay loam about 6 inches thick. The lower part is very channery loam about 4 inches thick. Limestone bedrock is at a depth of about 17 inches. The soil is mildly alkaline to a depth of 7 inches and is moderately alkaline below that depth.

Permeability is moderate in the Herakle soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of limestone. It occurs as long cliffs about 10 to 25 feet high and as small areas of exposed bedrock. The cliffs are at the crest of hogbacks.

This unit is used as woodland or for wildlife habitat.

The potential plant community is mainly Douglas-fir and an understory of common juniper, Arizona fescue, currant, and mountain muhly. The potential production of native understory vegetation in normal years is about 350 pounds of air-dry vegetation per acre. The production of forage is low on the Herakle soil.

This unit is suited to production of trees for sawtimber. The main limitation is the very low available water capacity. The productivity class for Douglas-fir is generally moderate.

If timber is harvested, measures that reduce the hazard of erosion should be applied. Properly designed road drainage systems and carefully placed culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Herakle soil is in the Douglas-Fir woodland site.

44—Hodden gravelly loam, 3 to 8 percent slopes. This deep, well drained soil is on fan terraces, fans, and foot slopes. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 8,800 to 9,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 85 days.

The surface layer is typically dark brown gravelly loam about 4 inches thick. The upper 9 inches of the subsoil is mainly very gravelly loam, and the lower 31 inches is very gravelly sandy loam. The substratum to a depth of 60 inches or more is extremely gravelly loamy sand. The lower part of the subsoil, below a depth of about 13 inches, has a high content of accumulated calcium carbonate. It is less clayey than the upper part of the subsoil. The soil is mainly neutral to a depth of 13 inches and is moderately alkaline below that depth. Small nests and narrow stringers of stones and cobbles make up about 5 percent of the unit.

Included with this soil in mapping are areas of Morset soils in concave positions on the landscape. These soils make up about 5 percent of the unit. They have a lower content of gravel than the Hodden soil.

Permeability is moderate in the Hodden soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland.

The potential plant community is mainly mountain muhly, blue grama, Arizona fescue, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, fringed sagebrush, and other forbs increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development, but the high content of stones can make excavation difficult.

The capability classification is VIe, nonirrigated. The soil is in the Mountain Loam, 10- to 16-inch precipitation zone #225 range site.

45—Hoodle loam, 5 to 20 percent slopes. This deep, well drained soil is on fan terraces and foot slopes. It formed in alluvium and colluvium. The native vegetation is mainly grasses. Elevation is 8,600 to 9,500 feet. The average annual precipitation is 18 to 20 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically very dark grayish brown loam about 10 inches thick. The upper part of the subsoil is mainly very gravelly clay loam about 16 inches thick, and the lower part to a depth of 60 inches or more is extremely gravelly sandy clay loam. The soil is neutral to a depth of 21 inches. It is mildly alkaline to a depth of 26 inches and is moderately alkaline below that depth. In areas on foot slopes and the upper part of fan terraces, the surface layer is commonly very gravelly sandy loam. In a few areas stones cover about 1 to 3 percent of the surface.

Included with this soil in mapping are areas of Adderton soils in drainageways. These soils make up about 5 percent of the unit. They have a dark surface layer more than 20 inches thick. Also included are soils that have a substratum of sand and gravel at a depth of about 20 inches. These soils are in delineations along Rock Creek in Gribbles Park. They make up about 10 percent of the unit.

Permeability is moderate in the Hoodle soil. Available water capacity is low or moderate. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, and prairie junegrass. The potential production of native understory vegetation in normal years is about 1,500 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, blue grama, bottlebrush squirreltail, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development in areas where the slope is about 15 percent or less.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

46—Jodero sandy loam, 2 to 5 percent slopes. This deep, well drained soil is on stream terraces and fans. It formed in mixed alluvium. The native vegetation is mainly grasses. Elevation is 7,700 to 8,700 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 80 to 100 days.

The upper part of the surface layer is typically dark grayish brown sandy loam about 10 inches thick. The next 20 inches is dark grayish brown sandy clay loam. Below this to a depth of 45 inches is dark gray loam. The substratum to a depth of 60 inches or more is very gravelly loamy sand. The soil is mildly alkaline to a depth of 10 inches. It is moderately alkaline to a depth of 45 inches and is neutral below that depth.

Included with this soil in mapping are areas of Cascajo Variant soils on fans where tributaries enter the major streams and in narrow, braided patterns on stream terraces. These soils have a surface layer of gravelly sandy loam. They are deep. They make up about 10 percent of the unit. Also included are small areas of Aquolls in low, depressional areas.

Permeability is moderate in the Jodero soil. Available water capacity is moderate or high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight or moderate.

Most areas of this soil are used for irrigated hay and pasture. A few areas are used as rangeland. A mixture of brome and alfalfa is commonly grown for hay and pasture.

The potential plant community is mainly blue grama, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, broom snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. The choice of crops is limited mainly to hay, pasture, and small grain by the short growing season.

Irrigation water can be applied by corrugation, flooding from contour ditches, or sprinklers. In sloping areas, leveling is needed for the efficient application and removal of irrigation water. The water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion.

If properly managed, this soil can produce 4 tons of irrigated alfalfa hay per acre. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage. The seedbed should be prepared on the contour or across the slope where practical. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

This soil is generally well suited to homesite development, except for a few low, flood-prone areas adjacent to Texas Creek.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

47—Jodero Variant clay loam, 1 to 3 percent slopes. This deep, moderately well drained soil is on stream terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 8,600 to 8,800 feet. The average annual precipitation is 13 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically brown and grayish brown clay loam about 12 inches thick. The underlying material to a depth of 60 inches or more is gray or grayish brown silty clay loam. The soil is moderately alkaline.

Included with this soil in mapping are areas of Cumulic Cryaquolls bordering the streams. These soils are poorly drained. They make up about 5 percent of the unit.

Permeability is moderately slow in the Jodero Variant. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare, very brief periods of flooding from May through August.

This soil is used as rangeland.

The potential plant community is mainly western wheatgrass, needleandthread, and slender wheatgrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, fringed sagebrush, slimstem muhly, bottlebrush squirreltail, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is poorly suited to homesite development. It is limited mainly by the rare flooding.

The capability classification is VIe, nonirrigated. The soil is in the Dry Mountain Swale #280 range site.

48—Kim loam, 0 to 3 percent slopes. This deep, well drained soil is on plains and fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,200 to 5,600 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 145 to 165 days.

The surface layer is typically grayish brown loam about 3 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is moderately alkaline.

Included in mapping are areas of soils that are similar to the Kim soil but have a seasonal high water table at a depth of 3 to 6 feet during the irrigation season. These soils make up about 5 percent of the unit.

Permeability is moderate in the Kim soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly for irrigated crops, mostly hay and pasture. It also is used as rangeland. A few small areas are used for apple orchards. Other minor crops include vegetables and corn for silage.

The potential plant community is mainly blue grama, western wheatgrass, and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, pricklypear, red threeawn, and ring muhly increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. Irrigation water can be applied by corrugation, flooding from contour ditches, border flooding, furrows, or sprinklers. The water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 6 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIe, irrigated, and VIe, nonirrigated. The soil is in the Loamy Plains #6 range site.

49—Kim loam, 3 to 8 percent slopes. This deep, well drained soil is on plains and fan terraces. It formed in alluvium and in eolian fine sands and silt. The native vegetation is mainly grasses. Elevation is 5,200 to 5,500 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically pale brown loam about 3 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is moderately alkaline.

Included with this soil in mapping are areas of Otero soils on ridges and Cascajo soils on short breaks. Otero soils make up about 5 percent of the unit. They are sandy loam throughout. Cascajo soils make up about 5 percent of the unit. They are mainly sand and gravel.

Permeability is moderate in the Kim soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to very rapid, and the hazard of water erosion is moderate to very high.

Most areas of this soil are used as rangeland. A few areas are used as irrigated cropland. Hay and pasture are the main irrigated crops. Corn for silage is a minor crop.

The potential plant community is mainly blue grama, western wheatgrass, and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, red threeawn, ring muhly, pricklypear, and broom snakeweed increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for irrigated crops, the main limitation is the hazard of erosion. The seedbed should be prepared on the contour or across the slope where practical. If furrow or corrugation irrigation systems are used, runs should be on the contour or across the slope. The water can be applied by furrow, corrugation, sprinklers, or flooding from contour ditches. It should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Leveling helps to ensure the uniform application of water.

Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. If properly managed, this soil can produce 3.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIIe, irrigated, and VIe, nonirrigated. The soil is in the Loamy Plains #6 range site.

50—Kim loam, cool, 3 to 8 percent slopes. This deep, well drained soil is on fans and fan terraces. It formed in alluvium and wind-deposited fine sands and silt. The native vegetation is mainly grasses. Elevation is 5,300 to 6,100 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 125 to 155 days.

The soil is typically loam to a depth of 60 inches or more. It is moderately alkaline.

Included with this soil in mapping are areas of Cascajo soils on short breaks. These soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the map unit.

Permeability is moderate in the Kim soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

Most areas of this soil are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community is mainly blue grama, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, broom snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

The major management concerns in areas used for irrigated hay and pasture are the hazard of erosion and the application of irrigation water. The seedbed should be prepared on the contour or across the slope where practical. In sloping areas, leveling is needed for the efficient application and removal of irrigation water. The water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 3.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

51—Kim loam, moderately wet, 0 to 3 percent slopes. This deep, moderately well drained and somewhat poorly drained soil is on stream and fan terraces. It formed in alluvium. Elevation is 5,200 to 5,300 feet. The average annual precipitation is 12 or 13 inches, the average annual air temperature is 52 or 53 degrees F, and the average frost-free period is 160 to 170 days.

In Lincoln Park this soil is typically loam to a depth of 60 inches or more. In the Fourmile area it consists of strata of loam, clay loam, and silty clay loam. It is moderately alkaline.

Included with this soil in mapping are areas of the moderately wet Limon soils in areas along Fourmile Creek. These soils have a surface layer of silty clay loam. They make up about 5 percent of the unit. They are slightly saline in some areas that are not irrigated. In these areas, the fluctuating water table deposits salts in the upper part of the soil.

Permeability is moderate in the Kim soil. Available water capacity is high. Effective rooting depth is somewhat limited by a seasonal high water table at a depth of 2 to 6 feet during the irrigation season. During other times of the year, the water table is at a depth of 3 to 8 feet and is below a depth of 5 feet in most areas. Runoff is slow, and the hazard of water erosion is slight.

The areas of this soil on high terraces along Fourmile Creek and the Arkansas River have a water table at a depth of about 2 to 6 feet during the irrigation season. A seasonal high water table is at a depth of about 3.5 feet or more in most areas, except near the channel of Fourmile Creek. The water table rises during peak flooding in spring and during the irrigation season. The areas of this soil in Lincoln Park are subject to a high water table at a depth of about 2 to 5 feet during the irrigation season. This high water table is caused by the restricted drainage of water seeping from irrigation conveyances and from deep percolation. Generally, the water table is deeper as the distance from sources of seepage increases.

This soil is used as irrigated cropland or for urban development. Hay and pasture are the main irrigated crops. Small areas are used for apple orchards or for small grain, corn for silage, or vegetables.

The potential plant community is mainly blue grama, western wheatgrass, and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre.

This soil is well suited to irrigated crops. The seasonal high water table reduces the amount of irrigation water needed to produce deep-rooted crops. The water can be applied by furrow, corrugation, sprinklers, or flooding from contour ditches. Drip irrigation is also suitable for fruit crops. Careful applications of the irrigation water help to prevent a buildup of the water table.

Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. If this soil is properly managed and moderately well drained, it can produce 6 tons of irrigated alfalfa hay per acre.

If this soil is used for homesite development, the main limitation is the seasonal high water table. If the seasonal high water table is at a depth of less than 4 feet, the soil is severely limited as a site for conventional septic tank absorption fields. Unless drainage is provided, full basements are not suitable. Also, the depth to the water table in early summer should be considered if a half basement is planned.

The capability classification is IIe, irrigated, and VIc, nonirrigated. The soil is in the Loamy Plains #6 range site.

52—Kim-Cascajo complex, 2 to 15 percent slopes. These soils are on breaks in areas where stream terraces cut through fans and fan terraces. They are also on fan terraces. The native vegetation is mainly grasses. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 10 to 13 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 125 to 165 days.

This unit is about 50 percent Kim soil and 35 percent Cascajo soil. The Kim soil is on foot slopes and in drainageways. The Cascajo soil is on the short, steeper breaks.

Included with these soils in mapping are areas of the shallow Midway and Shingle soils on breaks. Midway soils have a surface layer of very gravelly clay loam. They make up about 5 percent of the unit. Shingle soils have a surface layer of very stony fine sandy loam. They make up about 10 percent of the unit. In the eastern half of sec. 30, T. 18 S., R. 69 W., small areas of soils that have a high content of gypsum crystals are below a depth of 12 to 24 inches. These soils are similar to the Kim soil, but the surface is covered by rock fragments. The depth to weathered, gypsiferous shale is about 35 to 60 inches. Many of the gravelly or stony areas of these included soils are covered by pinyon and juniper.

The Kim soil is deep and well drained. It formed in alluvium. Slopes range from 2 to 10 percent. The surface layer is typically pale brown loam about 4 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is moderately alkaline.

Permeability is moderate in the Kim soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

The Cascajo soil is deep and excessively drained. It formed in gravelly and sandy alluvium. Slopes range from 10 to 15 percent. The surface layer is typically very dark grayish brown very gravelly sandy loam about 6 inches thick. The upper 15 inches of the substratum is extremely cobbly sandy loam. The lower part to a depth of 60 inches or more is extremely cobbly sand. The soil is moderately alkaline. A layer that has a high content of accumulated calcium carbonate is at depth of 6 to 21 inches.

Permeability is moderately rapid or rapid in the Cascajo soil. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This unit is used as rangeland.

The potential plant community on the Kim soil is mainly blue grama, western wheatgrass, sideoats grama, and sand dropseed. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, Russian thistle, ring muhly, red threeawn, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

The potential plant community on the Cascajo soil is mainly sideoats grama, blue grama, little bluestem, needleandthread, and Indian ricegrass. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, red threeawn, blue grama, annual forbs, and pricklypear increase. The main limitation affecting range seeding is the content of gravel and cobbles in the surface layer. Grazing management should include measures that protect the soil from excessive erosion. If the plant cover is disturbed, protection from flooding is needed to control gullying, streambank cutting, and sheet erosion. Loss of the surface layer results in a severe decrease in productivity and reduces the potential for producing suitable grazing plants.

This unit is well suited to homesite development in areas where the slope is less than about 8 percent. In the eastern half of sec. 30, T. 18. S., R. 69 W., areas of gypsiferous soil are not suitable for use as homesites.

The capability classification is VIe, nonirrigated. The unit is about 60 percent in the Loamy Plains #6 range site and 40 percent in the Gravel Breaks #64 range site.

53—Kim-Shingle complex, 3 to 20 percent slopes. These soils are on breaks and side slopes. The native vegetation is mainly grasses and scattered areas or clusters of pinyon and juniper. Elevation is 5,200 to 5,600 feet. The average annual precipitation is about 13 or 14 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free season is 150 to 160 days.

This unit is about 60 percent Kim fine sandy loam and 35 percent Shingle loam. The Kim soil is in grassed areas and areas that support pinyon and juniper. The Shingle soil supports clusters of pinyon and juniper. It is on small knobs and short breaks along the upper side slopes.

Included with these soils in mapping are areas of deep, sandy soils that have a thick cover of gravel on the surface. These included soils are on moderately steep side slopes. They make up about 5 percent of the unit. Also included are areas of Travessilla soils on ridges. These soils have a surface layer of channery loam. They are in delineations on the Fort Carson military reservation. They are shallow and are underlain by hard bedrock within a depth of 20 inches.

The Kim soil is deep and well drained. It formed in eolian fine sands and silt and in alluvium. Slopes range from 3 to 15 percent. The surface layer is typically brown loam about 3 inches thick. The substratum is fine sandy loam to a depth of 60 inches or more. The soil is mildly alkaline to a depth of 3 inches and is moderately alkaline below that depth. In some concave areas the subsoil contains more clay.

Permeability is moderate in the Kim soil. Available water capacity is high. Runoff is rapid, and the hazard of water erosion in cultivated areas is high or very high.

The Shingle soil is shallow and well drained. It formed in material weathered from interbedded shale and sandstone. Slopes range from 5 to 20 percent. The surface layer is typically grayish brown loam about 4 inches thick. Below this is loam about 8 inches thick. Shale is at a depth of about 12 inches. The soil is moderately alkaline and is calcareous throughout.

Permeability is moderate in the Shingle soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

This unit is used mainly as rangeland.

The potential plant community is blue grama, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 1,100 pounds per acre in areas of the Kim soil and about 400 pounds per acre in areas of the Shingle soil. If the condition of the range deteriorates, pricklypear, red threeawn, and ring muhly increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to homesite development in areas where the slope is about 8 percent or less. The depth to shale or sandstone is a moderate limitation in some areas that support pinyon and juniper on knobs and breaks. The slope also is a moderate limitation in areas where it is about 8 to 15 percent. It is a severe limitation in areas where it is more than 15 percent.

The capability classification is VIe, nonirrigated. The unit is about 60 percent in the Loamy Foothill #202 range site and 40 percent in the Shaly Foothill #212 range site.

54—Lakehelen-Rock outcrop complex, 45 to 80 percent slopes. This map unit is on very steep mountainsides and canyonsides. The native vegetation is mainly fir. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 45 to 70 days.

This unit is about 45 percent Lakehelen soil and 35 percent Rock outcrop. The Lakehelen soil is on side slopes, and the Rock outcrop is mainly on the upper side slopes and ridges.

Included in mapping are areas of the dry Bundo soils on foot slopes and along drainageways. These soils have a surface layer of very gravelly sandy loam. They are deep. They make up about 10 percent of the unit. Also included are areas of Wetmore soils on ridges and short, south-facing side slopes. These soils have a surface layer of very gravelly sandy loam. They are shallow. They make up about 10 percent of the unit. Small areas of talus are below bedrock cliffs.

The Lakehelen soil is moderately deep and is well drained. It formed in colluvium and residuum derived dominantly from gneiss and granite. Slopes range from 45 to 70 percent. The surface is typically covered with a mat of undecomposed fir litter about 1 inch thick over about 2 inches of decomposed fir litter. The surface layer is pale brown very gravelly fine sandy loam about 5 inches thick over about 10 inches of light brown extremely gravelly sandy loam. The subsoil is extremely gravelly loam about 8 inches thick. Fractured gneiss is at a depth of about 23 inches. The soil is neutral to a depth of 5 inches. It is slightly acid to a depth of 15 inches and is neutral below that depth. In some areas the surface layer is very stony sandy loam.

Permeability is moderate in the Lakehelen soil. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of gneiss or granite. It occurs mainly as short cliffs, ledges, and crags. The cliffs are about 20 to 75 feet high. In areas where the cliffs are not vertical, slopes range from about 45 to 80 percent.

This unit is used for watershed, wildlife habitat, or recreation.

The potential plant community is mainly Douglas-fir and some white fir and an understory of common juniper, kinnikinnick, and Oregongrape. The potential production of native understory vegetation in normal years is about 100 pounds per acre.

The Lakehelen soil is suited to production of Douglas-fir. The slope limits the equipment that can be used in forest management. The site index for Douglas-fir is about 50.

Most areas of this unit are in scenic Phantom Canyon. The slope limits the use of these areas mainly to a few paths and trails that extend across the slope.

This unit is poorly suited to homesite development. The main limitations are the slope and the Rock outcrop.

The capability classification is VIIs, nonirrigated. The Lakehelen soil is in the Douglas-Fir woodland site.

55—Larand very gravelly fine sandy loam, 10 to 40 percent slopes. This deep, well drained soil is mainly on mountainsides. One delineation is on a moraine along Stout Creek south of Howard. The soil formed in colluvium derived dominantly from granite, gneiss, tuff, andesite, and rhyolite and also formed in glacial outwash and till. The native vegetation is mainly conifers. Elevation is 9,600 to 11,600 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

The surface is typically covered with a mat of highly decomposed organic material about 1 inch thick. The surface layer is mainly light brown very gravelly fine sandy loam about 9 inches thick. The subsurface layer is very gravelly sandy loam about 6 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. The upper part of the substratum is extremely cobbly sandy clay loam about 6 inches thick. The lower part to a depth of 60 inches or more is extremely cobbly loamy sand. The soil is moderately acid. In some places the surface layer is very cobbly loam, very stony loam, or very cobbly sandy loam.

Included with this soil in mapping are areas of Bundo soils on north-facing side slopes. These soils have a surface layer of very cobbly sandy loam. They make up about 20 percent of the unit. They are deeper over a clayey subsoil than the Larand soil and have a less permeable substratum. Some small areas of soils that have a weakly developed subsoil are at elevations above 11,000 feet. Also included are small areas of rock outcrop on mountaintops and ridges and areas of Whiteman soils on ridges. Whiteman soils have a surface layer of cobbly loam. They are shallow and support bristlecone pine. They make up about 5 percent of the unit.

Permeability is moderate in the Larand soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

This soil is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly Engelmann spruce and some lodgepole pine, Douglas-fir, and white fir and an understory of elk sedge, common juniper, nodding bromegrass, and Kentucky bluegrass. The potential production of native understory vegetation in normal years is about 75 pounds per acre. Burned or cut areas are dominated by bristlecone pine and quaking aspen. A few areas in the upper part of Box Canyon west of Howard, near Copper Mountain northeast of Howard, and in Phantom Canyon are dominantly Douglas-fir and white fir.

This soil is suited to production of Engelmann spruce. The site index for Engelmann spruce is about 40. The main management concerns are the low available water capacity and the slope. In some areas surface stoniness limits felling and yarding. Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Generally, the hazard of erosion is slight or moderate on well designed roads and in minimally disturbed areas.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. It is less than 25 percent on some north-facing slopes. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is poorly suited to homesite development. The main limitations are the slope and the high content of rock fragments. The less sloping areas on mountaintops are suited to summer homesites.

The capability classification is VIIs, nonirrigated. The soil is in the Spruce-Fir woodland site.

56—Larkson stony loam, 5 to 20 percent slopes. This deep, well drained soil is on fan terraces. It formed in alluvium and colluvium derived dominantly from sedimentary rock. The native vegetation is mainly ponderosa pine. Elevation is 6,400 to 6,800 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 90 to 120 days.

The surface is typically covered with a mat of ponderosa pine and oak-brush litter about 2 inches thick. The surface layer is grayish brown stony loam about 3 inches thick. The subsurface layer is gravelly fine sandy loam about 5 inches thick. The upper 17 inches of the subsoil is clay loam, and the lower 15 inches is silty clay loam. The substratum to a depth of 60 inches or more is silt loam. The soil is neutral.

Included with this soil in mapping are areas of Tecolote soils on steep terrace edges. These soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit. They have a high content of gravel. Also included are soils that have a darker surface layer than the Larkson soil and areas of Martinsdale soils in small parks. Martinsdale soils have a thicker, darker surface layer than the Larkson soil. Also, they contain less clay in the subsoil. They make up about 5 percent of the unit.

Permeability is slow in the Larkson soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used for recreation, wildlife habitat, or livestock grazing. A small area southeast of Howard has been cleared and is used for irrigated hay crops, including brome and other grasses.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, Gambel oak, pine dropseed, wheatgrass, and snowberry. The potential production of native understory vegetation in normal years is about 700 pounds of air-dry vegetation per acre.

This soil is suited to production of ponderosa pine. Based on a site index of 55, the potential production per acre of merchantable timber is 3,000 cubic feet or 11,900 board feet (International rule, ⅛-inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

This soil is suited to limited production of high-value Christmas trees, which may be a viable economic alternative to the production of sawtimber. Ornamental ponderosa pine can be grown in areas of the Larkson soil for transplanting. In some areas, surface stoniness interferes with felling, yarding, and other operations involving the use of equipment.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees. Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that the content of moisture in the soil will be adequate for the establishment of seedlings in spring.

After trees are harvested, carefully managed reforestation helps to control competition from undesirable understory plants. The planting techniques used and local variations in climate greatly influence seedling survival.

If this soil is used for homesite development, the main limitations are restricted permeability in the subsoil and a high shrink-swell potential. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling.

The capability classification is VIe, nonirrigated. The soil is in the Ponderosa Pine woodland site.

57—Libeg extremely cobbly sandy loam, 10 to 20 percent slopes. This deep, well drained soil is on fan terraces. It formed in glacial outwash. The native vegetation is mainly grasses and shrubs. Elevation is 8,000 to 8,800 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 70 to 85 days.

The surface layer is typically dark brown extremely cobbly sandy loam about 7 inches thick. The subsoil is extremely cobbly sandy loam and sandy clay loam about 29 inches thick. The substratum to a depth of 60 inches or more is extremely cobbly sandy loam. The soil is neutral. In many places stones and cobbles on the surface form nests and stringers.

Included with this soil in mapping are areas of deep soils that have a dark surface layer of sandy loam more than 20 inches thick. These soils are along drainageways. They make up about 5 percent of the unit. Also included are small areas of soils on steep side slopes along deeply incised drainageways.

Permeability is moderate in the Libeg soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, western wheatgrass, and muttongrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, and other forbs and shrubs increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for homesite development, the main limitations are the slope and a high content of rock fragments. The soil is poorly suited to this use in areas where the slope is more than about 15 percent. The high content of cobbles and stones makes excavation somewhat difficult.

The capability classification is VIIs, nonirrigated. The soil is in the Loamy Glacial Outwash #291 range site.

58—Limon silty clay loam, saline. This deep, well drained soil is on stream terraces. It formed in clayey alluvium. Slopes are 0 to 1 percent. The native vegetation is mainly grasses. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 170 days.

The surface layer is typically brown silty clay loam about 3 inches thick. The substratum to a depth of 60 inches or more is clay. The soil is moderately alkaline to a depth of 3 inches and is strongly alkaline below that depth.

Included with this soil in mapping are areas of Gaynor soils generally adjacent to uplands. These soils are moderately deep. They make up about 5 percent of the unit. Also included are areas of Limon soils that are generally slightly saline or moderately saline.

Permeability is slow in the Limon soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare, very brief periods of flooding in the spring and early summer. When the soil is dry, cracks form that are 1 inch wide and 4 to 12 inches deep.

Most areas of this soil are used as rangeland. A few areas are used as irrigated cropland. Hay and pasture are the main irrigated crops.

The potential plant community is mainly alkali sacaton, western wheatgrass, blue grama, and fourwing saltbush. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, black greasewood, fourwing saltbush, and inland saltgrass increase. The main limitations affecting range seeding are poor tilth of the natural topsoil and shallow wetting of the soils by natural precipitation.

If this soil is used for irrigated crops, the main limitations are the slow permeability and the poor tilth. Unless irrigation water is properly managed, the soil also is subject to the concentration of salts in the root zone.

Irrigation water can be applied by corrugation or by flooding from contour ditches. Sprinkler irrigation is generally not suitable because the intake rate is very slow after the initial application. Because of the slow permeability, the applications of water should be regulated so that water does not stand on the surface and damage the crops.

Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. If properly managed, this soil can produce 4 tons of irrigated alfalfa hay per acre.

If this soil is used for homesite development, the main limitations are the slow permeability and a high shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems should be used.

The capability classification is IIIs, irrigated, and VIs, nonirrigated. The soil is in the Salt Flat #34 range site.

59—Limon silty clay loam, moderately wet, 0 to 2 percent slopes. This deep, moderately well drained and somewhat poorly drained soil is on stream terraces. It formed in alluvium derived dominantly from shale. Elevation is 5,200 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically brown silty clay loam about 9 inches thick. The substratum to a depth of 60 inches or more is silty clay. The soil is moderately alkaline.

Permeability is slow. Available water capacity is moderate. Effective rooting depth is somewhat limited by a seasonal high water table during the irrigation season. In most areas the water table is generally at a depth of more than 2.5 feet. Runoff is slow, and the hazard of water erosion is slight. When the soil is dry, cracks form that are ½ to 1 inch wide and 4 to 12 inches deep.

During the irrigation season, water seeps from unlined irrigation conveyances and the seasonal high water table is at a depth of 1.5 to 4.0 feet. The depth to the water table is shallowest in areas near sources of seepage. It varies within short distances. In most areas the water table recedes to a depth of 6 feet or more during other times of the year. The soil is nonsaline in most areas, but it is slightly saline or moderately saline in areas where water from storm runoff and seepage from conveyances collect. Salts collect at the surface.

This soil is used as irrigated cropland or for urban development. Hay and pasture are the main irrigated crops. A few areas also are used for small grain or corn for silage.

The potential plant community is mainly alkali sacaton, western wheatgrass, blue grama, and fourwing saltbush. The average annual production of air-dry vegetation is about 1,250 pounds per acre. If the condition of the range deteriorates, fourwing saltbush and inland saltgrass increase.

If this soil is used for irrigated crops, the main limitations are the slow permeability, poor tilth, and, in some areas, the limited rooting depth above a seasonal high water table. Unless irrigation water is properly managed, the soil also is subject to the buildup of salts in the root zone. Applications of irrigation water should be adjusted as necessary when the water table rises into the root zone. The water can be applied by furrow, corrugation, or flooding from contour ditches. Sprinkler irrigation is generally not suitable because it causes ponding or runoff after water is applied. The intake rate decreases significantly after the upper part of the soil becomes wet.

Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. If this soil is properly managed and moderately well drained, it can produce 5 tons of irrigated alfalfa hay per acre.

If this soil is used for homesite development, the main limitations are a moderate shrink-swell potential and the seasonal high water table. The potential for shrinking and swelling of the soil around foundations has been reduced because seepage and former crop irrigation have moistened the soil, and irrigation of lawns helps to maintain a constant soil moisture content. Basements are not suitable in most areas unless the seepage from irrigation water is drained. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. The seasonal high water table also generally makes conventional systems unsuitable.

The capability classification is IIIs, irrigated, and VIs, nonirrigated. The soil is in the Salt Flat #34 range site.

60—Limon silty clay loam, moderately wet, rarely flooded, 0 to 1 percent slopes. This deep, moderately well drained and somewhat poorly drained soil is on stream terraces. It formed in alluvium derived dominantly from shale. Elevation is 5,200 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically brown silty clay loam about 6 inches thick. The substratum to a depth of 60 inches or more is silty clay. The soil is moderately alkaline. When the soil is dry, cracks may form that are ½ to 1 inch wide and 4 to 12 inches deep. The soil is nonsaline in most areas, but it is slightly or moderately saline in areas where water from storm runoff and seepage from conveyances collect. Areas along drainageways in the Orchard Park area northwest of Canon City are particularly saline.

Included with this soil in mapping are some small areas of soils that have a seasonal high water table at or near the surface during the irrigation season. These soils are along drainageways in the northwestern part of Canon City. They are subject to rare, brief periods of flooding. However, the Red Canyon Draw area and other special hazard areas are subject to flooding more than 5 times in 100 years.

Permeability is slow in the Limon soil. Available water capacity is moderate. Effective rooting depth is somewhat limited by a seasonal high water table during the irrigation season. In most areas the water table is generally at a depth of more than 2.5 feet. Runoff is slow, and the hazard of water erosion is slight.

During the irrigation season, water seeps from unlined irrigation conveyances and the seasonal high water table is at a depth of 1.5 to 4.0 feet. The depth to the water table varies within short distances but is shallowest near the sources of seepage. In many areas the water table recedes to a depth of 6 feet or more during other times of the year.

This soil is used for irrigated hay and pasture or for urban development.

The potential plant community is mainly alkali sacaton, western wheatgrass, blue grama, and fourwing saltbush. The average annual production of air-dry vegetation is about 1,250 pounds per acre.

If this soil is used for irrigated crops, the main limitations are the slow permeability, poor tilth, and, in some areas, the limited rooting depth above a seasonal high water table. Unless irrigation water is properly managed, the soil also is subject to the buildup of salts in the root zone. Applications of irrigation water should be adjusted as necessary when the water table rises into the root zone. The water can be applied by furrow, corrugation, or flooding from contour ditches. Sprinkler irrigation is generally not suitable because it causes ponding or runoff after the water is applied. The intake rate decreases significantly after the upper part of the soil becomes wet.

Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. If this soil is properly managed and moderately well drained, it can produce 5 tons of irrigated alfalfa hay per acre.

If this soil is used for homesite development, the main limitations are a moderate shrink-swell potential and the seasonal high water table. The potential for shrinking and swelling of the soil around foundations has been reduced because seepage and former crop irrigation have moistened the soil, and irrigation of lawns helps to maintain a constant soil moisture content. Basements are not suitable in most areas unless the seepage from irrigation water is drained. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. The seasonal high water table also generally makes conventional systems unsuitable.

The capability classification is IIIw, irrigated, and VIw, nonirrigated. The soil is in the Salt Flat #34 range site.

61—Limon-Gaynor silty clay loams, 0 to 3 percent slopes. These soils are on foot slopes. The native vegetation is mainly grasses and shrubs. Elevation is 5,100 to 5,500 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 170 days.

This unit is about 70 percent Limon soil and 30 percent Gaynor soil. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

The Limon soil is deep and well drained. It formed in alluvium derived dominantly from shale. The surface layer is typically brown silty clay loam about 3 inches thick. The substratum to a depth of 46 inches or more is silty clay. Weathered shale is at a depth of about 46 inches. The soil is moderately alkaline.

Permeability is slow in the Limon soil. Available water capacity is moderate. Effective rooting depth is 40 to more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. When the soil is dry, cracks form that are ½ to 1 inch wide and 4 to 12 inches deep.

The Gaynor soil is moderately deep and is well drained. It formed in alluvium and residuum derived from shale. The surface layer is typically grayish brown silty clay loam about 4 inches thick. The substratum is silty clay about 18 inches thick over fractured, calcareous shale. The soil is moderately alkaline.

Permeability is slow in the Gaynor soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. It also is used as rangeland.

The potential plant community on the Limon soil is mainly alkali sacaton, blue grama, western wheatgrass, and fourwing saltbush. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, fourwing saltbush, and black greasewood increase.

The potential plant community on the Gaynor soil is mainly alkali sacaton, blue grama, and western wheatgrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, shadscale, frank bush, pricklypear, and red threeawn increase. Grazing management includes measures that protect the soils from excessive erosion. If the amount of plant cover is low, protective measures are needed to control gullying, streambank cutting, and sheet erosion. Loss of the surface layer severely limits productivity and reduces the potential of the soils to produce plants suitable for grazing. The main limitations affecting range seeding are poor tilth of the natural topsoil and shallow wetting of the soils by natural precipitation.

If this unit is used for irrigated crops, the main limitations are the slow permeability, poor tilth, and the limited effective rooting depth in some areas. Unless irrigation water is properly managed, these soils also are subject to the concentration of salts in the root zone. The water can be applied by corrugation or by flooding from contour ditches. Sprinkler irrigation is generally not suitable because of the slow permeability. The intake rate decreases significantly after the upper part of the soil becomes wet.

Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. If properly managed, these soils can produce 4 tons of irrigated alfalfa hay per acre.

If this unit is used for homesite development, the main limitations are the slow permeability and a high shrink-swell potential. In some areas the depth to shale also is a significant limitation on sites for septic tank absorption fields. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. Maintaining the existing plant cover during construction helps to control erosion.

The capability classification is IIIe, irrigated, and VIs, nonirrigated. The unit is about 70 percent in the Salt Flat #34 range site and 30 percent in the Shaly Plains #46 range site.

62—Limon-Gaynor silty clay loams, 3 to 12 percent slopes. These soils are on foot slopes. The native vegetation is mainly grasses and shrubs. Elevation is 5,100 to 5,500 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 150 to 170 days.

This unit is about 55 percent Limon soil and 35 percent Gaynor soil. The Limon soil is on foot slopes and in drainageways, and the Gaynor soil is on side slopes and foot slopes.

Included with these soils in mapping are areas of Midway soils on the upper side slopes. These included soils have a surface layer of clay loam. They are shallow. They make up about 10 percent of the unit. Also included are areas of gullies that generally range from 8 to 15 feet in depth. These areas make up about 1 to 5 percent of the unit.

The Limon soil is deep and well drained. It formed in alluvium derived dominantly from shale. The surface layer is typically brown silty clay loam about 3 inches thick. The substratum is silty clay about 43 inches thick. Shale bedrock is at a depth of about 46 inches. The soil is moderately alkaline.

Permeability is slow in the Limon soil. Available water capacity is moderate. Effective rooting depth is 40 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Gaynor soil is moderately deep and is well drained. It formed in alluvium and residuum derived from shale. The surface layer is typically grayish brown silty clay loam about 4 inches thick. The substratum is silty clay about 26 inches thick over soft, weathered shale. The soil is moderately alkaline.

Permeability is slow in the Gaynor soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

When these soils are dry, cracks form that are ½ to 1 inch wide and 4 to 12 inches deep.

This unit is used as rangeland.

The potential plant community on the Limon soil is mainly alkali sacaton, blue grama, western wheatgrass, and fourwing saltbush. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, fourwing saltbush, black greasewood, and blue grama increase.

The potential plant community on the Gaynor soil is mainly alkali sacaton, blue grama, and western wheatgrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, western wheatgrass, fourwing saltbush, shadscale, and frank bush increase. Grazing management should include measures that protect the soils from excessive erosion. If the amount of plant cover is low, protective measures are needed to control gullying, streambank cutting, and sheet erosion. Loss of the surface layer severely limits productivity and reduces the potential of the soils to produce plants suitable for grazing. The main limitations affecting range seeding are poor tilth of the natural topsoil and shallow wetting of the soils by natural precipitation.

If this unit is used for homesite development, the main limitations are the slow permeability and a high shrink-swell potential. In some areas the depth to shale also is a significant limitation on sites for septic tank absorption fields. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. Maintaining the existing plant cover during construction helps to control erosion.

The capability classification is VIe, nonirrigated. The unit is about 60 percent in the Salt Flat #34 range site and 40 percent in the Shaly Plains #46 range site.

63—Limon-Gaynor silty clay loams, moderately wet, 0 to 3 percent slopes. These soils are on fans. The native vegetation is mainly grasses and shrubs. Elevation is 5,200 to 5,300 feet. The average annual precipitation is 11 or 12 inches, the average annual air temperature is 52 or 53 degrees F, and the average frost-free period is 160 to 170 days.

This unit is about 65 percent Limon soil and 30 percent Gaynor soil. The Limon soil is in nearly level areas in the lower part of the unit, and the Gaynor soil is in gently sloping areas in the upper part of the unit.

Included with these soils in mapping are areas of Midway soils in the upper part of the unit. These included soils have a surface layer of clay loam. They are shallow. They make up about 5 percent of the unit.

The Limon soil is deep and is moderately well drained or somewhat poorly drained. It formed in alluvium derived dominantly from shale. The surface layer is typically brown silty clay loam about 3 inches thick. The substratum to a depth of 60 inches or more is silty clay. Weathered shale is generally at a depth of 4 to 8 feet. The soil is moderately alkaline.

Permeability is slow in the Limon soil. Available water capacity is moderate. Effective rooting depth is limited by a seasonal high water table at a depth of 2.5 to 4.0 feet during the irrigation season. Runoff is slow, and the hazard of water erosion is slight.

The Gaynor soil is moderately deep and is moderately well drained or somewhat poorly drained. It formed in alluvium and residuum derived from shale. The surface layer is typically grayish brown silty clay loam about 4 inches thick. The substratum is silty clay loam about 26 inches deep over soft, weathered shale. The soil is moderately alkaline.

Permeability is slow in the Gaynor soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

When these soils are dry, cracks form that are ½ to 1 inch wide and 4 to 12 inches deep. The soils are nonsaline in most areas, but they are slightly saline or moderately saline in areas where water from storm runoff and seepage from conveyances collect. Salts collect at the surface.

During the irrigation season, the water table is at a depth of about 1.5 to 4.0 feet. The ground water seeps from unlined irrigation canals and ditches. It is perched above the shale underlying the soils. The water table is generally shallowest in areas near the irrigation conveyances, but depth to the water table varies greatly within short distances. In most areas the water table is at a depth of 6 feet or more between irrigation seasons.

This unit is used mainly for irrigated hay and pasture. It also is used for urban development.

The potential plant community is mainly alkali sacaton, western wheatgrass, blue grama, and fourwing saltbush. The average annual production of air-dry vegetation is about 1,250 pounds per acre on the Limon soil and about 800 pounds per acre on the Gaynor soil.

If this unit is used for irrigated crops, the main limitations are the slow permeability, poor tilth, and, in some areas, the limited effective rooting depth. Unless irrigation water is properly managed, the soils also are subject to the concentration of salts in the root zone. Irrigation water can be applied by furrow, corrugation, or flooding from contour ditches. Sprinkler irrigation is generally not suitable because it causes ponding of the water on the surface or runoff after the water is applied. The intake rate decreases significantly after the upper part of the soil becomes wet.

Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The content of organic matter can be maintained by incorporating all crop residue into the soil, plowing under cover crops, and using a suitable rotation. If properly managed and moderately well drained, these soils can produce 4.5 tons of irrigated alfalfa hay per acre.

If this unit is used for homesite development, the main limitations are a moderate shrink-swell potential and the seasonal high water table. In some areas the depth to shale also is a significant limitation on sites for septic tank absorption fields. The potential for shrinking and swelling of the soil around foundations has been reduced in most areas because seepage and former crop irrigation have moistened the soil, and irrigation of lawns helps to maintain a constant soil moisture content. Basements are not suitable in most areas unless the seepage from irrigation water is drained. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed. The seasonal high water table also generally makes conventional systems unsuitable.

The capability classification is IIIs, irrigated, and VIs, nonirrigated. The unit is in the Salt Flat #34 range site.

64—Louviers-Travessilla complex, 20 to 50 percent slopes. These soils are on hills, ridges, hogbacks, and canyonsides. The native vegetation is mainly pinyon and juniper. Elevation is 5,300 to 6,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 120 to 150 days.

This unit is about 40 percent Louviers soil and 35 percent Travessilla soil. The Louviers soil is on side slopes and on the scarp side of hogbacks. The Travessilla soil is on canyon rims, ridges, and the upper part of side slopes and in areas of weather-resistant bedrock on hogbacks.

Included with these soils in mapping are areas of sandstone rock outcrop on ridges, canyon rims, and side slopes. These areas make up about 5 percent of the unit. Also included are areas of moderately deep, clayey soils on side slopes. These included soils make up about 5 percent of the unit. Areas of the deep Cascajo soils are on the crest of side slopes and on foot slopes. These soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit. Also included are areas of the deep Kim and Otero soils in drainageways. Kim soils have a surface layer of loam. They make up about 5 percent of the unit. Otero soils also make up about 5 percent of the unit. They have a surface layer of sandy loam. A few small areas of gypsum land are along the south edge of Sixmile Park.

The Louviers soil is shallow and well drained. It formed in residuum derived dominantly from shale and siltstone. The surface layer is typically light brownish gray very channery clay loam about 3 inches thick. The substratum is mainly clay about 13 inches thick. Shale bedrock is at a depth of about 16 inches. The soil is neutral to a depth of 3 inches. It is mildly alkaline to a depth of 6 inches and is neutral below that depth. In some areas the soil is calcareous and moderately alkaline. In other areas the surface layer is very cobbly or very stony.

Permeability is slow in the Louviers soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. The surface layer is typically light brown channery loam about 4 inches thick. The substratum is channery loam about 10 inches thick. Sandstone bedrock is at a depth of about 14 inches. The soil is moderately alkaline.

Permeability is moderate in the Travessilla soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as noncommercial woodland, for livestock grazing, or for wildlife habitat. Livestock have limited access to the steeper areas because of the slope, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, western wheatgrass, blue grama, sideoats grama, Gambel oak, and mountainmahogany. The potential production of native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, red threeawn, blue grama, pricklypear, and other forbs and shrubs increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in other areas. The use of tree spades for removal of transplants is severely limited.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soils from erosion.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The unit is in the Pinyon-Juniper woodland site.

65—Manvel silt loam, 0 to 3 percent slopes. This deep, well drained soil is on plains, foot slopes, fans, and stream terraces. It formed in alluvium derived from limestone and shale. The native vegetation is mainly grasses. Elevation is 5,000 to 5,300 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 160 to 170 days.

The surface layer is typically brown silt loam about 6 inches thick. The substratum to a depth of 60 inches or more is silt loam. The soil is moderately alkaline.

Included with this soil in mapping are areas of Minnequa soils on the foot slopes of ridges. These soils are moderately deep. They make up about 5 percent of the unit.

Permeability is moderate or moderately slow in the Manvel soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly as irrigated cropland. It also is used as rangeland. Hay and pasture are the main irrigated crops. Alfalfa or a mixture of grass and alfalfa is commonly grown. Small areas are used for irrigated apple orchards or grape vineyards.

The potential plant community is mainly blue grama, western wheatgrass, and winterfat. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, ring muhly, red threeawn, pricklypear, and broom snakeweed increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. Important management concerns include the efficient application of irrigation water and maintenance of soil fertility.

If row crops or small grain is grown, a crop rotation system that includes grasses and legumes helps to maintain fertility and tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate. Soil blowing can be minimized by returning crop residue to the soil and using minimum tillage.

Irrigation water can be applied by furrow, corrugation, border flooding, sprinklers, or flooding from contour ditches. Drip irrigation also can be used in areas used for orchards or vineyards. Fertilizer is needed for the optimum growth of grasses, legumes, and other crops. If the soil is properly managed and the supply of irrigation water is adequate, 5 tons of alfalfa hay per acre can be produced.

This unit is well suited to homesite development. The shrink-swell potential is a moderate limitation.

The capability classification is IIe, irrigated, and VIe, nonirrigated. The unit is in the Loamy Plains #6 range site.

66—Manvel silt loam, 3 to 8 percent slopes. This deep, well drained soil is on foot slopes, plains, and fans. It formed in alluvium derived dominantly from limestone and shale. The native vegetation is mainly grasses. Elevation is 5,000 to 5,700 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 155 to 170 days.

The surface layer is typically brown silt loam about 6 inches thick. The substratum to a depth of 60 inches or more is silt loam. The soil is moderately alkaline.

Included with this soil in mapping are areas of Minnequa and Shingle soils in the steeper areas. Minnequa soils are moderately deep. They make up about 5 percent of the unit. Shingle soils are shallow. They have a surface layer of loam. They make up about 5 percent of the unit.

Permeability is moderate or moderately slow in the Manvel soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to very rapid, and the hazard of water erosion is moderate to very high.

This soil is used mainly as rangeland. It also is used for irrigated hay and pasture. Alfalfa or a mixture of grass and alfalfa is commonly grown.

The potential plant community is mainly blue grama, western wheatgrass, and winterfat. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, ring muhly, red threeawn, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

Important management concerns in areas used for irrigated hay and pasture are the hazard of erosion and the efficient application of irrigation water. The seedbed should be prepared on the contour or across the slope where practical. Leveling helps to ensure the uniform application of water.

If small grain or row crops are grown, including grasses and legumes in the crop rotation helps to maintain soil fertility and tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate. Soil blowing can be minimized by returning crop residue to the soil and using minimum tillage.

Irrigation water can be applied by furrow, corrugation, or sprinklers. If furrow or corrugation irrigation systems are used, runs should be on the contour or across the slope. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. If properly managed, this soil can produce 3.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development. The shrink-swell potential is a moderate limitation.

The capability classification is IIIe, irrigated, and VIe, nonirrigated. The soil is in the Loamy Plains #6 range site.

67—Manvel silty clay loam, saline. This deep, moderately well drained soil is on stream terraces and in swales. It formed in alluvium derived dominantly from limestone and shale. Slopes range from 1 to 3 percent. The native vegetation is mainly grasses. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 160 to 170 days.

The upper part of the soil is typically silty clay loam about 30 inches thick. Below this to a depth of 60 inches or more is silt loam. The soil is moderately alkaline and is saline.

Included with this soil in mapping is an area of very poorly drained soils. These soils are in the southwest corner of sec. 6, T. 19 S., R. 68 W., adjacent to the Brush Hollow Creek drainageway. They have a high water table caused by the seepage of irrigation water. Slopes range from 3 to 6 percent. The vegetation is typical of saline meadow areas.

Permeability is moderate or moderately slow in the Manvel soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight or moderate. In most areas the upper part of the soil is moderately saline, but in a few areas the upper part of the soil is only slightly saline. The salinity of the root zone may be significantly lower in areas where irrigation water is applied.

This soil is used mainly as rangeland. It also is used for irrigated hay and pasture. Alfalfa or a mixture of grass and alfalfa is commonly grown.

The potential plant community is mainly alkali sacaton, blue grama, western wheatgrass, and fourwing saltbush. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, inland saltgrass, fourwing saltbush, and black greasewood increase. Range seeding is suitable if the range is in poor condition.

Important management concerns in areas used for irrigated hay and pasture are a buildup of salts in the root zone, the efficient application of irrigation water, and maintenance of fertility and tilth. Salt-tolerant crops should be selected for planting.

Adequate amounts and frequent applications of irrigation water help to leach salts and prevent an increase in the salinity of the root zone during the growing season. The water can be applied by furrow, corrugation, border flooding, or sprinklers. In sloping areas, leveling is needed for the efficient application and removal of irrigation water.

If small grain or row crops are grown, including grasses and legumes in the crop rotation helps to maintain fertility and tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. If the soil is properly managed, the supply of irrigation water is adequate, and salinity is kept low in the root zone, 4 tons of alfalfa hay per acre can be produced.

If this soil is used for homesite development, the shrink-swell potential is a moderate limitation. In low areas, the potential for the buildup of salts at the surface is an important consideration affecting landscaping. Some areas may be subject to infrequent flooding.

The capability classification is IIIs, irrigated, and VIs, nonirrigated. The soil is in the Salt Flat #34 range site.

68—Manzanola loam, 1 to 5 percent slopes. This deep, well drained soil is on fans and plains. It formed in alluvium. Elevation is 5,100 to 5,700 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 140 to 170 days.

The surface layer is typically light yellowish brown loam about 4 inches thick. The subsoil is silty clay loam to a depth of 60 inches or more. The soil is moderately alkaline.

Included with this soil in mapping are areas of Gaynor soils in concave positions near gullies. These soils have a surface layer of silty clay loam. They are moderately deep. They make up about 10 percent of the unit.

Permeability is slow in the Manzanola soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland.

The potential plant community is mainly blue grama, western wheatgrass, and galleta. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, red threeawn, pricklypear, broom snakeweed, and walkingstick cholla increase. Range seeding is suitable if the range is in poor condition. If the plant cover is disturbed, protective measures are needed to control gullying, streambank cutting, and sheet erosion.

If this soil is used for homesite development, the main limitations are a high shrink-swell potential and the slow permeability. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the restricted permeability. Other types of sewage disposal systems may be needed.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Plains #6 range site.

69—Martinsdale sandy loam, 3 to 12 percent slopes. This deep, well drained soil is on fans and foot slopes of intermontane basins. It formed in mixed alluvium. The native vegetation is mainly grasses. Elevation is 6,800 to 8,200 feet. The average annual precipitation is 13 to 16 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 85 to 105 days.

The surface layer is typically dark brown sandy loam about 5 inches thick. The subsoil is mainly sandy clay loam about 40 inches thick. The substratum to a depth of 60 inches or more is gravelly sandy loam. The soil is neutral to a depth of 11 inches and is moderately alkaline below that depth. The lower 24 inches of the subsoil has a high content of accumulated calcium carbonate.

Included with this soil in mapping are areas of Jodero soils in drainageways. These soils make up about 5 percent of the unit. They have a thicker dark surface layer than the Martinsdale soil. Areas of gneiss and granite rock outcrop are on ridges. They make up about 5 percent of the unit. Also included are a few areas of Curecanti soils on narrow ridges. These soils are gravelly and cobbly throughout.

Permeability is moderately slow in the Martinsdale soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to very high.

Most areas of this soil are used as rangeland. A few areas are used for irrigated hay.

The potential plant community is mainly western wheatgrass, needleandthread, blue grama, and fringed sagebrush. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, blue grama, bottlebrush squirreltail, sleepygrass, rabbitbrush, and other undesirable forbs and shrubs increase. Range seeding is suitable if the range is in poor condition. A few areas, totaling about 80 acres in size, in the center of sec. 21 and sec. 22, T. 47 N., R. 12 E., are eroded to the subsoil. Thick stands of pinyon and juniper have developed in these areas.

Important management concerns in areas used for irrigated hay and pasture are the hazard of erosion and a uniform distribution of irrigation water. The choice of crops is limited mainly to hay, pasture, and small grain because of the short growing season. If properly managed, this soil can produce 4 tons of irrigated alfalfa hay per acre.

Irrigation water can be applied by flooding from contour ditches, corrugation, or sprinklers. Adjusting the applications of water to the available water capacity, the water intake rate, and the needs of the crop helps to prevent overirrigating and the leaching of plant nutrients. Leveling helps to ensure the uniform application of water. The seedbed should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus.

This soil is well suited to homesite development.

The capability classification is IVe, irrigated and nonirrigated. The soil is in the Mountain Loam, 13- to 18-inch precipitation zone #226 range site.

70—Martinsdale Variant sandy loam, 2 to 5 percent slopes. This deep, well drained soil is on the lower end of fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 7,500 to 7,600 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 90 to 100 days.

The surface layer is typically dark brown sandy loam about 16 inches thick. The upper part of the subsoil is sandy loam about 5 inches thick over 12 inches of sandy clay loam. The lower part of the subsoil to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 21 inches. It is mildly alkaline to a depth of 33 inches and is moderately alkaline below that depth.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland or for irrigated pasture.

The potential plant community is mainly western wheatgrass, needleandthread, and blue grama. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

Important management concerns in areas used for irrigated hay and pasture are the hazard of erosion and the efficient application of irrigation water. In spring or fall, hay commonly is drill planted in areas that are covered with oat stubble. The oat stubble serves as a ground cover until the new crop is established. The seedbed should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus.

Irrigation water can be applied by sprinklers, corrugation, or flooding from contour ditches. Leveling helps to ensure the uniform application of water. Adjusting the applications of water to the available water capacity, the water intake rate, and the needs of the crop helps to prevent overirrigating and the leaching of plant nutrients. If properly managed, this soil can produce 4.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IVe, irrigated and nonirrigated. The soil is in the Mountain Loam, 13- to 18-inch precipitation zone #226 range site.

71—Midway clay loam, 3 to 15 percent slopes. This shallow, well drained soil is on ridges and knolls on the plains. It formed in residuum derived dominantly from shale. The native vegetation is mainly grasses. Elevation is 5,100 to 5,600 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically light yellowish brown clay loam about 3 inches thick. The upper 6 inches of the substratum is clay, and the lower part to a depth of 16 inches is extremely shaly clay. Highly fractured, weathered clay shale is at a depth of about 16 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of Gaynor and Limon soils on foot slopes. These soils have a surface layer of silty clay loam. Gaynor soils are moderately deep. They make up about 5 percent of the unit. Limon soils are deep. They also make up about 5 percent of the unit. Also included are Shingle soils in small areas that have a thin cap of siltstone residuum over shale. These soils have a surface layer of loam. They make up about 5 percent of the unit. They are less clayey than the Midway soil. Also included is an area, about 60 acres in size, of shaly badland. This area is in the south-central part of sec. 23, T. 18 S., R. 68 W. It supports widely scattered Gambel oak, ponderosa pine, pinyon, and juniper.

Permeability is slow in the Midway soil. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used as rangeland. A few small areas are used for irrigated hay or pasture. The soil is poorly suited to tillage and crop production.

The potential plant community is mainly alkali sacaton, blue grama, galleta, and western wheatgrass. The average annual production of air-dry vegetation is about 550 pounds per acre. If the condition of the range deteriorates, galleta, greasewood, winterfat, western wheatgrass, fourwing saltbush, and frank bush increase. The main limitations affecting range seeding are very shallow wetting, a high runoff rate during most storms, and poor tilth in the thin topsoil. Range pitting is suitable in areas where the slope is about 10 percent or less.

This soil is poorly suited to homesite development. The main limitations are the depth to shale, a high shrink-swell potential, and the slow permeability.

The capability classification is VIe, nonirrigated. The soil is in the Shaly Plains #46 range site.

72—Midway-Cascajo complex, 10 to 40 percent slopes. These soils are on moderately sloping to steep ridges, knobs, hills, and edges of fan terraces that are deeply dissected by streams. The native vegetation is mainly grasses, cactus, and scattered pinyon and juniper. Elevation is 5,300 to 6,500 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 150 to 165 days.

This unit is about 60 percent Midway soil and 20 percent Cascajo soil. The Midway soil is mainly on the steeper side slopes. The Cascajo soil is mainly on knobs and hills and along the crests of terrace edges.

Included with these soils in mapping are areas of Kim soils on terraces, tops of hills, and foot slopes. Kim soils have a surface layer of loam. They make up about 10 percent of the unit. Also included are small areas of shale outcrop on the steeper side slopes and some areas, making up about 10 percent of the unit, of soils that are similar to the Cascajo soil but are shallow or moderately deep to shale bedrock.

The Midway soil is shallow and well drained. It formed in residuum derived dominantly from shale. Slopes range from 15 to 40 percent. The surface layer is typically grayish brown very gravelly clay loam about 3 inches thick. The upper 4 inches of the underlying material is clay. The lower part to a depth of 15 inches is extremely shaly clay. Weathered shale is at a depth of about 15 inches. The soil is mildly alkaline to a depth of 7 inches and is moderately alkaline below that depth.

Permeability is slow in the Midway soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

The Cascajo soil is deep and excessively drained. It formed in gravelly and sandy alluvium. Slopes range from 10 to 40 percent. The surface layer is typically very dark grayish brown very gravelly sandy loam about 6 inches thick. The upper 15 inches of the underlying material is extremely cobbly sandy loam. The lower part to a depth of 60 inches or more is extremely cobbly sand. The soil is moderately alkaline. A high content of accumulated calcium carbonate is between depths of 6 and 21 inches.

Permeability is moderately rapid or rapid in the Cascajo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium to very high, and the hazard of water erosion is moderate to very high.

This unit is used as rangeland.

The potential plant community is mainly sideoats grama, blue grama, needleandthread, Indian ricegrass, and little bluestem. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, red threeawn and annual forbs increase.

This unit is poorly suited to homesite development. The main limitations are the depth to shale bedrock and the slope.

The capability classification is VIIe, nonirrigated. The unit is in the Gravel Breaks #64 range site.

73—Morset loam, 2 to 8 percent slopes. This deep, well drained soil is on toe slopes and fans. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 8,600 to 9,600 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically brown loam about 8 inches thick. The upper 7 inches of the subsoil is clay loam, the next 32 inches is loam, and the lower part to a depth of 60 inches or more is sandy clay loam. The soil is mildly alkaline to a depth of 15 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Adderton soils in swales. These soils make up about 5 percent of the unit. They have a dark surface layer that is more than 20 inches thick. Also included are steeper areas in sec. 11, T. 51 N., R. 10 E. These areas are made up of Hodden and Chittum soils and soils that are similar to the Chittum soils but are moderately deep. Hodden soils are gravelly loam. They make up about 5 percent of the unit. Chittum soils are shallow.

Permeability is moderate in the Morset soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as rangeland.

The potential plant community is mainly western wheatgrass, Arizona fescue, and needleandthread. The potential production of native understory vegetation in normal years is about 750 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, slimstem muhly, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is VIe, nonirrigated. The soil is in the Mountain Loam, 10- to 16-inch precipitation zone #225 range site.

74—Mussel-Bronell complex, 2 to 15 percent slopes. These soils are on foot slopes, fans, and fan terraces. The native vegetation is mainly grasses and open stands of pinyon and juniper. Elevation is 6,100 to 7,600 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 60 percent Mussel soil and 40 percent Bronell soil. The Mussel soil is in open parks and supports grassy vegetation, and the Bronell soil is in gravelly areas and supports open stands of pinyon and juniper.

The Mussel soil is deep and well drained. It formed in alluvium. Slopes range from 2 to 10 percent. The surface layer is typically grayish brown sandy loam about 6 inches thick. The upper part of the substratum is sandy loam about 22 inches thick. The lower part to a depth of 60 inches or more is loam. The soil is moderately alkaline.

Permeability is moderate in the Mussel soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to very high.

The Bronell soil is deep and well drained. It formed in alluvium. Slopes range from 2 to 15 percent. The surface layer is typically grayish brown gravelly sandy loam about 5 inches thick. The upper part of the substratum is gravelly sandy loam about 11 inches thick. The lower part to a depth of 60 inches or more is very gravelly sandy loam. In areas immediately adjacent to drainageways, stones and cobbles are common on the surface and the substratum is very gravelly loamy sand. A layer that has a high content of finely divided calcium carbonate is at a depth of 16 to 26 inches. The soil is moderately alkaline.

Permeability is moderately rapid in the Bronell soil.

Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This unit is used as rangeland or for irrigated hay and pasture.

The potential plant community on the Mussel soil is mainly blue grama, western wheatgrass, needleandthread, and sideoats grama. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, broom snakeweed, and other undesirable forbs or shrubs increase.

The potential plant community on the Bronell soil is mainly open stands of pinyon and juniper and Scribner needlegrass, blue grama, and needleandthread. Most stands of pinyon and juniper are several acres or less in size. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, red threeawn, pinyon, juniper, and undesirable forbs and shrubs increase. Range seeding is suitable, but broadcast seeding generally is necessary because of pebbles and cobbles in the surface layer.

Woodland products, such as firewood, pinyon nuts, and Christmas trees, can be harvested from areas that support pinyon and juniper. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion.

Areas of the Mussel soil are well suited to irrigated hay and pasture. Irrigation water can be applied by furrow, corrugation, flooding from contour ditches, or sprinklers. Adjusting the applications of water to the available water capacity, the water intake rate, and the needs of the crop helps to prevent overirrigating and the leaching of plant nutrients.

Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. If properly managed, these soils can produce 4.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to homesite development. The slope is a limitation in areas where it is more than about 8 percent.

The capability classification of the Mussel soil is IVe, irrigated, and VIe, nonirrigated. The capability classification of the Bronell soil is VI, nonirrigated. The unit is about 60 percent in the Loamy Foothill #202 range site and 40 percent in the Gravelly Foothill #214 range site.

75—Neville fine sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on fans, foot slopes, and fan terraces. It formed in alluvium derived dominantly from red sandstone and siltstone. The native vegetation is mainly grasses. Elevation is 6,000 to 6,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically reddish brown fine sandy loam about 3 inches thick. The substratum is mainly loam. The soil is mildly alkaline to a depth of 3 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Rizozo soils in the steeper areas. These soils have a surface layer of channery loam. They are shallow. They make up about 5 percent of the unit.

Permeability is moderate in the Neville soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used mainly as rangeland. It also is used for irrigated hay and pasture. Alfalfa or a mixture of alfalfa and grass is commonly grown. Barley and oats are grown for feed and as nurse crops in areas used for alfalfa.

The potential plant community is mainly blue grama, western wheatgrass, needleandthread, and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, pricklypear, bottlebrush squirreltail, and broom snakeweed increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to hay and pasture. The main management concerns are the proper use of water, the maintenance of soil fertility, and the hazard of erosion. The addition of green manure or barnyard manure improves soil tilth. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus.

Plantings should be on the contour or across the slope where practical. Corrugations and furrows should also be on the contour or across the slope. Adjusting the applications of irrigation water to the available water capacity, the water intake rate, and the needs of the crop helps to prevent overirrigating and the leaching of plant nutrients. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. If properly managed, this soil can produce 3.5 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

76—Nunn stony loam, 3 to 8 percent slopes. This deep, well drained soil is on fan terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,900 to 6,300 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically brown stony loam about 4 inches thick. The subsoil is mainly clay loam about 23 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 13 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Nederland soils in the steeper areas along drainageways. These soils have a surface layer of extremely stony sandy loam. They make up about 5 percent of the unit.

Permeability is moderately slow or slow in the Nunn soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used as rangeland.

The potential plant community is mainly western wheatgrass, blue grama, needleandthread, little bluestem, and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, yucca, red threeawn, and pricklypear increase. Range seeding is suitable if the range is in poor condition. Grazing management should include measures that protect the soil from excessive erosion.

If this soil is used for homesite development, the main limitation is the restricted permeability in the subsoil. Conventional septic tank absorption fields do not function adequately unless absorption lines are placed below the subsoil. Other types of sewage disposal systems may be needed. The shrink-swell potential is a moderate limitation on building sites. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

77—Nunn loam, 2 to 5 percent slopes. This deep, well drained soil is on foot slopes and fans. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,200 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 53 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically brown loam about 4 inches thick. The subsoil is clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is clay loam. The soil is neutral to a depth of 10 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Fort Collins soils in the steeper areas. These soils make up about 5 percent of the unit. They have less clay in the subsoil than the Nunn soil. Also included are areas of Shanta soils in swales. These soils make up about 5 percent of the unit. They have a thicker dark surface layer than the Nunn soil. Areas of Wages soils are in the steeper areas. These soils make up about 5 percent of the unit. They have less clay in the subsoil than the Nunn soil. Small areas of Nunn soils that have a surface layer of stony loam are along swales.

Permeability is moderately slow or slow in the Nunn soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

Most areas of this soil are used as rangeland. A few areas are used as cropland. Wheat is the main crop. In many years the supply of water is insufficient for the growth of crops.

The potential plant community is mainly western wheatgrass, blue grama, little bluestem, prairie junegrass, and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, rabbitbrush, and walkingstick cholla increase. Range seeding is suitable if the range is in poor condition.

Important management concerns in areas used for irrigated hay and pasture include controlling erosion or soil blowing, preventing the development of a tillage pan, and conserving soil moisture. Irrigation water can be applied by sprinklers or by flooding from contour ditches. Applying the water at a slow rate over a long period helps to ensure that the root zone contains sufficient moisture.

Tillage should be kept to a minimum and should be on the contour or across the slope. Excessive tillage can result in the formation of a tillage pan. If a tillage pan is formed, it can be broken by subsoiling when the soil is dry. Leaving crop residue on or near the surface helps to control runoff, minimizes soil blowing, and helps to maintain tilth and organic matter content. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

If this soil is used for homesite development, the main limitation is the restricted permeability in the subsoil. The absorption lines of septic tank absorption fields should be placed below the subsoil. Increasing the size of the absorption fields helps to compensate for the restricted permeability. The shrink-swell potential is a moderate limitation on building sites. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

78—Nunn clay loam, 0 to 2 percent slopes. This deep, well drained soil is on fans and fan terraces. It formed in loess and alluvium. The native vegetation is mainly grasses. Elevation is 5,200 to 5,900 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically brown clay loam about 10 inches thick. The subsoil is clay loam to a depth of 60 inches or more. The soil is neutral to a depth of 35 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Wages soils on short breaks. These soils have a surface layer of loam. They make up about 5 percent of the unit. Also included are areas of Shanta soils in swales. These soils make up about 5 percent of the unit. They have a thicker dark surface layer than the Nunn soil.

Permeability is moderately slow or slow in the Nunn soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This soil is used for irrigated or dryland crops or as rangeland. Wheat and hay are the main irrigated crops. In many areas the water supply is inadequate to significantly supplement rainfall. Dryland wheat is grown in some areas.

The potential plant community is mainly western wheatgrass, blue grama, little bluestem, prairie junegrass, and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama and red threeawn increase. Grazing management should include measures that protect the soil from excessive erosion.

This soil is well suited to irrigated crops. The moderately slow or slow permeability in the subsoil is a limitation. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone contains sufficient moisture.

Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. If properly managed, this soil can produce 5 tons of irrigated alfalfa-grass hay per acre.

If this soil is used for nonirrigated crops, the main limitation is a limited amount of precipitation. Leaving crop residue on or near the surface helps to control runoff, minimizes soil blowing, and helps to maintain tilth and organic matter content. Excessive cultivation can result in the formation of a tillage pan. The tillage pan can be broken by subsoiling when the soil is dry. If properly managed, this soil can produce 25 bushels of wheat per acre in areas where a cropping rotation system that conserves moisture is used.

If this soil is used for homesite development, the main limitation is the restricted permeability in the subsoil. Conventional septic tank absorption fields do not function adequately unless absorption lines are placed beneath the subsoil. Other types of sewage disposal systems may be needed. The shrink-swell potential is a moderate limitation on building sites. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling.

The capability classification is IIs, irrigated, and IVc, nonirrigated. The soil is in the Loamy Foothill #202 range site.

79—Nunn clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans, fan terraces, and foot slopes. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,900 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically brown clay loam about 4 inches thick. The subsoil is clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is clay loam. The soil is neutral to a depth of 10 inches and is moderately alkaline below that depth. An area in the southeastern one-fourth of sec. 11, T. 17 S., R. 67 W., contains red soils that are similar to the Nunn soil.

Included with this soil in mapping are areas of Wages soils in the steeper areas. These soils have a surface layer of loam. They make up about 5 percent of the unit. They have less clay in the subsoil than the Nunn soil. Also included are small areas of Nunn soils that have a surface layer of stony loam. These soils are on upland breaks and in upland drainageways.

Permeability is moderately slow or slow in the Nunn soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as rangeland.

The potential plant community is mainly western wheatgrass, blue grama, needleandthread, prairie junegrass, and little bluestem. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, fringed sagebrush, and walkingstick cholla increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for homesite development, the main limitation is the moderately slow permeability in the subsoil. The absorption lines of septic tank absorption fields should be placed below the subsoil. Increasing the size of the absorption fields also helps to compensate for the restricted permeability. The shrink-swell potential is a moderate limitation on building sites. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The design of foundations and bearing walls should offset the effects of shrinking and swelling. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

80—Otero loamy fine sand, 3 to 8 percent slopes. This deep, well drained soil is on side slopes. It formed in alluvium and eolian fine sands. The native vegetation is mainly grasses. Elevation is 5,100 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 150 to 170 days.

The surface layer is typically pale brown loamy fine sand about 3 inches thick. The substratum to a depth of 60 inches or more is fine sandy loam. The soil is moderately alkaline.

Included with this soil in mapping are areas of Kim soils. These soils have a surface layer of loam. They make up about 5 percent of the unit. They are less sandy than the Otero soil.

Permeability is moderately rapid in the Otero soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas of this soil are used as rangeland. A few areas are used as irrigated cropland. Hay and small grain are the main crops.

The potential plant community is mainly blue grama, sideoats grama, little bluestem, needleandthread, and sand dropseed. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, red threeawn, broom snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for irrigated crops, the main limitation is the limited available water capacity and a rapid rate of water intake. Because of the rapid water intake rate, sprinkler irrigation is the best method of irrigation. If furrow irrigation is used, the water should be applied at frequent intervals and runs should be short. Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus.

This soil is well suited to homesite development.

The capability classification is IVe, irrigated, and VIe, nonirrigated. The soil is in the Sandy Plains #26 range site.

81—Otero fine sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on side slopes and fans. It formed in alluvium and eolian sands. The native vegetation is mainly grasses. Elevation is 5,300 to 5,900 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 49 to 52 degrees F, and the average frost-free period is 130 to 155 days.

The surface layer is typically dark grayish brown fine sandy loam about 2 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is mildly alkaline to a depth of 25 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Kim soils. These soils have a surface layer of loam. They make up about 5 percent of the unit. They are less sandy than the Otero soil.

Permeability is moderately rapid in the Otero soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

This soil is used as rangeland.

The potential plant community is mainly blue grama, sand dropseed, Indian ricegrass, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, sand dropseed, yucca, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is IVe, nonirrigated. The soil is in the Sandy Foothill #210 range site.

82—Pendant extremely gravelly loam, 10 to 40 percent slopes, very stony. This shallow, well drained soil is on hilly cuestas and pediments. It formed in residuum derived dominantly from limestone. The native vegetation is mainly pinyon and juniper. Elevation is 7,100 to 7,400 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 44 to 46 degrees F, and the average frost-free period is 100 to 120 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is brown extremely gravelly loam about 4 inches thick. The subsurface layer is extremely gravelly loam about 7 inches thick. Limestone is at a depth of about 11 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of Kerhayden soils in drainageways and Bronell soils on foot slopes. Kerhayden soils have a surface layer of gravelly sandy loam. They make up about 5 percent of the unit. Bronell soils have a surface layer of very gravelly loam. They make up about 5 percent of the unit. Also included are areas of rock outcrop. These areas make up about 5 percent of the unit. They occur throughout the unit as exposed surfaces of bedrock and as low ledges about 1 to 6 feet high.

Permeability is moderate in the Pendant soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as noncommercial woodland or for livestock grazing.

The potential plant community is mainly pinyon and juniper and an understory of sideoats grama, blue grama, Scribner needlegrass, Indian ricegrass, and mountainmahogany. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, red threeawn, pricklypear, and broom snakeweed increase.

The pinyon and juniper have been chained in most areas. Removing pinyon and juniper increases the production of understory forage. Range seeding should be in conjunction with removal of the overstory. Mechanical treatment is not practical because of surface stoniness and the slope. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

83—Penrose-Minnequa complex, 2 to 25 percent slopes. These soils are on ridges, plains, and short breaks. The native vegetation is mainly grasses. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 150 to 170 days.

This unit is about 45 percent Penrose soil and 40 percent Minnequa soil. The Penrose soil is mainly on ridges and breaks and in the steeper areas. Scattered juniper trees are common in areas of the Penrose soil. The Minnequa soil is mainly on side slopes and in the gently sloping areas.

Included with these soils in mapping are areas of the deep Manvel soils on toe slopes and swales. These soils have a surface layer of silt loam. They make up about 10 percent of the unit. Areas of limestone rock outcrop are on the tops of ridges and on breaks. These areas make up about 5 percent of the unit. Also included are small areas of the moderately deep Gaynor soils in drainageways along the eastern base of Skyline Ridge in Canon City. These soils are clayey.

The Penrose soil is shallow and well drained. It formed in residuum derived dominantly from limestone. Slopes range from 2 to 25 percent. The surface layer is typically light brownish gray channery loam about 4 inches thick. The substratum is channery loam about 11 inches thick. Limestone bedrock is at a depth of about 15 inches. The soil is moderately alkaline.

Permeability is moderate in the Penrose soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow to very rapid, and the hazard of water erosion is slight to very high.

The Minnequa soil is moderately deep and is well drained. It formed in residuum derived dominantly from limestone and shale. Slopes range from 2 to 15 percent. The surface layer is typically light brownish gray silt loam about 2 inches thick. The subsoil and substratum are silty clay loam about 26 inches thick. They are underlain by slightly hard, fractured limestone at a depth of about 28 inches. The soil is moderately alkaline.

Permeability is moderate in the Minnequa soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas of this unit are used as rangeland. A few areas, mainly small areas of the Minnequa soil, are used as irrigated cropland. Hay and pasture are the main irrigated crops. Small grain also is grown. Small areas of this unit are used as vineyards or for apple orchards.

The potential plant community on the Penrose soil is mainly sideoats grama, blue grama, Scribner needlegrass, Indian ricegrass, and scattered areas of juniper. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, blue grama, sand dropseed, red threeawn, and undesirable forbs invade or increase. Range seeding is suitable if the range is in poor condition. Some areas near rock outcrops have many channery fragments on the surface. Mechanical methods of reseeding may not be practical in these areas.

The potential plant community on the Minnequa soil is mainly blue grama, western wheatgrass, and winterfat. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, pricklypear, broom snakeweed, and red threeawn increase.

The Penrose soil is generally unsuitable for the production of most crops because of the depth to bedrock. The Minnequa soil is limited by the low available water capacity and the moderate depth to bedrock. It is suitable for the production of most crops in a few areas where it is more than about 3 feet thick. It is suitable for the production of grapes and apples. Areas of the Penrose soil also can be used for grape production.

Irrigation water can be applied by furrow, corrugation, or drip systems, by sprinklers, or by flooding from contour ditches. It should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. All adapted pasture plants can be grown, but bunch-type species planted individually generally are not suitable because of the hazard of erosion. The seedbed should be prepared on the contour or across the slope where practical. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage.

The suitability of this unit for homesite development varies, depending on the depth to bedrock and the slope at a specific site. The unit is generally poorly suited to buildings with basements and to conventional septic tank absorption fields because of the depth to bedrock. In many areas the upper part of the bedrock can be excavated with a light backhoe. In these areas, the Penrose soil is suitable for dwellings without basements. Except for some small areas of deep soils in drainageways, the unit is unsuited to septic tank absorption fields. Unfiltered effluent can seep through the fractures in the interbedded limestone and shale and can contaminate ground water or downslope areas. The unit is poorly suited to homesite development in areas where the slope is more than about 15 percent.

The capability classification is IVe, irrigated, and VIe, nonirrigated. The unit is about 50 percent in the Limestone Breaks #58 range site and 50 percent in the Loamy Plains #6 range site.

84—Penrose-Rock outcrop complex, 25 to 40 percent slopes. This map unit is on steep or very steep ridges, hogbacks, breaks, and canyonsides. The native vegetation is mainly pinyon and juniper. Elevation is 5,100 to 6,000 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 145 to 165 days.

This unit is about 60 percent Penrose soil and 30 percent Rock outcrop. The components are so intricately intermingled in most areas that it was not practical to map them separately at the scale used. The Rock outcrop is mainly in extremely steep or vertical areas. The Penrose soil is mainly in areas that have slopes of 40 percent or less.

Included in mapping are areas of Minnequa soils on side slopes, in swales, and on foot slopes. These soils have a surface layer of silt loam. They are moderately deep. They make up about 5 percent of the unit. Areas of Shingle soils are on ridges and breaks. These soils have a surface layer of loam and are underlain by soft bedrock. They do not have hard bedrock within a depth of 20 inches. They make up about 5 percent of the unit. Also included are a few areas of the moderately deep Gaynor soils in the lower swales and on toe slopes. These soils are clayey.

The Penrose soil is shallow and well drained. It formed in residuum derived dominantly from limestone. The surface layer is typically light brownish gray channery loam about 4 inches thick. The substratum is channery loam about 11 inches thick. Hard limestone bedrock is at a depth of about 15 inches. The soil is moderately alkaline.

Permeability is moderate in the Penrose soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of interbedded limestone and shale. It occurs mainly as ledges and cliffs 1 to 30 feet high, but only the top surface of the bedrock strata is exposed in many areas of pediments and ridges.

This unit is used as rangeland.

The potential plant community is mainly sideoats grama, blue grama, Scribner needlegrass, Indian ricegrass, and scattered or open stands of oneseed juniper or Rocky Mountain juniper. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, juniper and unpalatable forbs, such as frank bush, red threeawn, and pricklypear, increase.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Penrose soil is in the Limestone Breaks #58 range site.

85—Querida gravelly sandy loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and stream terraces. It formed in alluvium. The native vegetation is mainly grasses and forbs. Elevation is 6,500 to 7,000 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 100 to 125 days.

The surface layer is typically brown gravelly sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is gravelly sandy loam. The soil is mildly alkaline to a depth of 2 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of very gravelly and cobbly soils along stream channels. These soils make up about 10 percent of the unit.

Permeability is moderately rapid in the Querida soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas of this soil are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community is mainly blue grama, needleandthread, Indian ricegrass, and sand dropseed. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, broom snakeweed, red threeawn, blue grama, and sand dropseed increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for irrigated crops, the main limitations are the moderately rapid rate of water intake and the low available water capacity. Irrigation water can be applied by sprinklers, corrugation, or flooding from contour ditches. Because of the water intake rate, sprinkler irrigation is the best suited method of irrigation. If furrow irrigation is used, the water should be applied at frequent intervals and in short runs.

In sloping areas, leveling is needed for the efficient application and removal of irrigation water. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 4 tons of irrigated alfalfa hay per acre.

This soil is well suited to homesite development.

The capability classification is IIIe, irrigated, and VIe, nonirrigated. The soil is in the Sandy Foothill #210 range site.

86—Raleigh-Rock outcrop complex, 15 to 40 percent slopes. This map unit is on mountainsides. The native vegetation is mainly conifers. Elevation is 8,600 to 9,200 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

This unit is about 70 percent Raleigh soil and 20 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of Guffey soils on foot slopes and along drainageways. These soils are moderately deep. They make up about 5 percent of the unit. Also included are areas of the deep Adderton soils along drainageways. These soils have a surface layer of loam. They make up about 5 percent of the unit.

The Raleigh soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from granite and granodiorite. Slopes range from 15 to 40 percent. The surface layer is typically grayish brown very gravelly sandy loam about 2 inches thick. The subsoil is very gravelly sandy loam about 11 inches thick. The substratum is extremely gravelly sandy loam about 5 inches thick. Partially decomposed granodiorite is at a depth of about 18 inches. The soil is slightly acid to a depth of 2 inches and is neutral below that depth.

Permeability is moderately rapid in the Raleigh soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Rock outcrop consists mainly of granodiorite that occurs as bouldery knobs. Some of the outcrops occur only as the exposed bedrock surface. Slopes range from 20 to 40 percent.

This unit is used for livestock grazing, wildlife habitat, or recreation.

The potential plant community is mainly ponderosa pine and some Douglas-fir and white fir and an understory of Gambel oak, Arizona fescue, mountain muhly, and muttongrass. If the condition of the understory deteriorates, blue grama, needlegrass, Kentucky bluegrass, and prairie junegrass increase. In normal years the potential production of native understory vegetation, including the new growth of brush, is about 600 pounds of air-dry vegetation per acre. The potential production of grass and forb forage species in normal years is almost 400 pounds of air-dry vegetation per acre.

The Raleigh soil is suited to production of ponderosa pine. Many areas of the soil are dominated by Gambel oak and an overstory of scattered pine. The use of tree spades for removal of transplants is severely limited.

This unit is poorly suited to homesite development. The main limitations are the slope, the depth to bedrock, and the Rock outcrop.

The capability classification is VIIs, nonirrigated. The Raleigh soil is in the Ponderosa Pine woodland site.

87—Redcameron-Rock outcrop-Teaspoon complex, 20 to 70 percent slopes. This map unit is on a series of hogbacks formed by the uneven erosion of highly tilted strata of sedimentary rock. The native vegetation is mainly pinyon and juniper. Elevation is 7,400 to 8,500 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 30 percent Redcameron soil, 30 percent Rock outcrop, and 20 percent Teaspoon soil. Some extremely shallow soils and as much as about 55 percent Rock outcrop are in the extremely steep areas. The Redcameron soil is on the west-facing side slopes of scarps. The Rock outcrop is on the crests of hogbacks, commonly occurring as short ledges and cliffs; on west-facing slopes, occurring as bands of sandstone and siltstone; and on east-facing side slopes where the surface of the upper sandstone strata is exposed. The Teaspoon soil is on east-facing side slopes.

Included in mapping are areas of Rentsac soils on west-facing side slopes. These soils are similar to the Redcameron soil but have a high content of channers. They make up about 15 percent of the unit. Also included are areas of the deep Mussel soils on foot slopes and along drainageways. These soils have a surface layer of sandy loam. They make up about 5 percent of the unit.

The Redcameron soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and siltstone. Slopes range from 20 to 45 percent. The surface layer is typically pinkish gray channery loam about 2 inches thick. The substratum is channery very fine sandy loam about 10 inches thick. Hard, fractured sandstone is at a depth of about 12 inches. The soil is moderately alkaline. In some areas the surface layer is very channery loam.

Permeability is moderate in the Redcameron soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

The Rock outcrop on west-facing slopes consists of sandstone and some siltstone. It occurs as narrow bands and ledges. On east-facing slopes, it consists of resistant sandstone. It occurs as inclined planes. Slopes range from 30 to 70 percent.

The Teaspoon soil is shallow and well drained. It formed in residuum with a thin mantle of alluvium derived dominantly from sandstone. Slopes range from 20 to 50 percent. The surface layer is typically brown very stony sandy loam about 3 inches thick. The subsoil is extremely channery sandy loam about 5 inches thick. Hard sandstone is at a depth of 8 inches. The soil is neutral.

Permeability is moderate in the Teaspoon soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used mainly as noncommercial woodland, for wildlife habitat, or for livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Scribner needlegrass, sideoats grama, and true mountainmahogany. If the condition of the understory deteriorates, blue grama, red threeawn, and undesirable forbs increase. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, transplants, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and the depth to bedrock. The site index for pinyon and juniper is about 40. Pinyon and juniper reproduction is slow and difficult because of the Rock outcrop and the depth to bedrock. Some areas where trails are developed are accessible, but the terrain is rugged in many areas.

This unit is poorly suited to homesite development. The main limitations are the slope, the depth to bedrock, and rockiness.

The capability classification is VIIs, nonirrigated. The Redcameron and Teaspoon soils are in the Pinyon-Juniper woodland site.

88—Rentsac very channery loam, 20 to 55 percent slopes. This shallow, well drained soil is on mountainsides. It formed in residuum derived dominantly from limestone and some sandstone. The native vegetation is mainly pinyon and juniper. Elevation is 7,200 to 8,800 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 90 to 115 days.

This soil is very channery loam about 10 inches deep over limestone. It is moderately alkaline.

Included with this soil in mapping are areas of sandstone and limestone rock outcrop. These areas make up about 10 percent of the unit. Some nearly vertical strata of limestone occur as long, narrow cliffs and projections as much as 40 feet high. Also included are areas of soils that are similar to the Rentsac soil but are 20 to 40 inches deep over bedrock. These soils make up about 5 percent of the unit. Areas of the deep Bronell soils are on foot slopes and along drainageways. These soils have a surface layer of very gravelly loam. They make up about 5 percent of the unit.

Permeability is moderately rapid in the Rentsac soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is very high.

This soil is used as noncommercial woodland, for wildlife habitat, or for livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and true mountainmahogany. The potential production of native understory vegetation in normal years is about 150 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, can be harvested in areas of this soil. Access to these products, however, is severely limited by the slope and the rough surface.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

89—Rentsac Variant channery loam, 5 to 25 percent slopes. This shallow, well drained soil is on hills. It formed in colluvium and residuum derived dominantly from limestone. The native vegetation is mainly grasses. Elevation is 8,800 to 9,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 80 days.

The surface layer is typically brown channery loam about 7 inches thick. The substratum is very channery loam about 12 inches thick. Hard limestone bedrock is at a depth of about 19 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of the deep Morset soils on toe slopes. These soils have a surface layer of loam. They make up about 5 percent of the unit. Also included are areas of limestone rock outcrop on the upper side slopes. These areas make up about 5 percent of the unit. The rock outcrop occurs as short cliffs about 5 to 15 feet high at the crest of some side slopes.

Permeability is moderate in the Rentsac Variant. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, Indian ricegrass, blue grama, needleandthread, mountain muhly, and western wheatgrass. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, slimstem muhly, blue grama, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition. In some areas reseeding is impractical because of the depth to bedrock.

This soil is poorly suited to homesite development. The main limitation is the depth to bedrock. The slope is a significant limitation in areas where it is more than about 15 percent.

The capability classification is VIIe, nonirrigated. The soil is in the Dry Shallow Loam #232 range site.

90—Resort very gravelly sandy loam, 20 to 45 percent slopes. This shallow, somewhat excessively drained soil is on mountainsides. It formed in residuum derived dominantly from granodiorite. The native vegetation is mainly pinyon and juniper. Elevation is 7,500 to 8,800 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 75 to 100 days.

The surface layer is typically dark grayish brown very gravelly sandy loam about 8 inches thick. The subsoil is very gravelly sandy loam about 4 inches thick. The substratum is extremely gravelly loamy sand about 5 inches thick. It is underlain by soft, weathered granodiorite. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Included with this soil in mapping are areas of the deep Bronell soils on foot slopes. These soils have a surface layer of gravelly sandy loam. They make up about 5 percent of the unit. Also included are areas of granodiorite rock outcrop on ridges and in the steeper positions. These areas make up about 5 percent of the unit.

Permeability is rapid in the Resort soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate to very high.

This soil is used as noncommercial woodland or for livestock grazing.

The potential plant community is mainly pinyon and juniper and an understory of mountain muhly, true mountainmahogany, and Gambel oak. The potential production of native understory vegetation in normal years is about 250 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, mountainmahogany, blue grama, and bottlebrush squirreltail increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in other areas. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and by the depth to bedrock.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production. Suitable seeding mixtures include pubescent wheatgrass, Russian wildrye, and blue grama. Range seeding is feasible, but broadcast seeding generally is necessary because of the slope.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

91—Resort-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 75 to 100 days.

This unit is about 60 percent Resort soil and 30 percent Rock outcrop.

Included in mapping are areas of Bronell soils on foot slopes. These soils have a surface layer of gravelly sandy loam. They make up about 10 percent of the unit.

The Resort soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from granodiorite. The surface layer is typically dark grayish brown very gravelly sandy loam about 8 inches thick. The subsoil is very gravelly sandy loam about 4 inches thick. The substratum is extremely gravelly loamy sand. Soft granodiorite bedrock is at a depth of about 17 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Permeability is rapid in the Resort soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of granodiorite and similar rocks. It occurs mainly as short cliffs, ledges, and crags.

This unit is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly pinyon and juniper and an understory of mountain muhly, true mountainmahogany, and Gambel oak. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

This unit is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope.

The capability classification is VIIs, nonirrigated. The Resort soil is in the Pinyon-Juniper woodland site.

92—Riverwash. This map unit is along the channels of the Arkansas River and its major tributaries. It is almost entirely barren, but a few willow trees grow on bars. Scattered cottonwood and willow trees and other plants grow in small areas of included soils on flood plains. Scrubby pinyon and juniper are common on adjacent terrace edges in the foothills. Elevation is 5,000 to 7,200 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 42 to 52 degrees F, and the average frost-free period is 80 to 150 days.

Included in mapping are small areas of deep, poorly drained or somewhat poorly drained soils on flood plains. Also included are small areas of Bronell soils on short, steep terrace edges and some areas of igneous and sedimentary bedrock outcrop on stony and cobbly terrace edges. The terrace edges border the channel of the Arkansas River in the foothills.

Riverwash typically consists of alluvial sand, gravel, and cobbles. It is subject to scouring and receives fresh deposits of alluvium from floodwater.

The capability classification is VIIIw.

93—Rizozo-Neville complex, 3 to 30 percent slopes. These soils are on gently sloping to moderately steep fan terraces, pediments, and fans. The native vegetation is mainly pinyon and juniper in the steeper areas and grasses in the less steep areas. Elevation is 6,000 to 6,700 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 130 to 160 days.

This unit is about 50 percent Rizozo soil and 40 percent Neville soil. The Rizozo soil is in the steeper areas and supports pinyon and juniper. The Neville soil is in gently sloping or moderately sloping areas and supports grasses.

Included with these soils in mapping are areas of rock outcrop in the steeper positions. These areas make up about 5 percent of the unit. Also included are areas of Sedillo soils on terrace edges along drainageways that dissect the fan terraces. These soils are deep and are more gravelly than the Rizozo and Neville soils. They make up about 5 percent of the unit.

The Rizozo soil is shallow and well drained. It formed in residuum derived dominantly from red sandstone. Slopes range from 10 to 30 percent. The surface layer is typically weak red channery loam about 3 inches thick. The substratum is pale red loam about 10 inches thick. Hard, pale red sandstone is at a depth of about 13 inches. The soil is moderately alkaline.

Permeability is moderate in the Rizozo soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Neville soil is deep and well drained. It formed in alluvium derived dominantly from red sandstone and siltstone. Slopes range from 3 to 10 percent. The surface layer is typically yellowish red fine sandy loam about 3 inches thick. The substratum is loam to a depth of 60 inches or more. The soil is mildly alkaline to a depth of 3 inches and is moderately alkaline below that depth.

Permeability is moderate in the Neville soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to very high, and the hazard of water erosion is moderate to very high.

This unit is used as rangeland.

The potential plant community on the Rizozo soil is mainly pinyon and juniper and an understory of sideoats grama, blue grama, and Scribner needlegrass. The potential production of native understory vegetation on the Rizozo soil is about 200 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, pricklypear, red threeawn, and undesirable forbs increase. Pinyon and juniper have limited economic value, and the site class is generally low. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion.

The potential plant community on the Neville soil is mainly blue grama, western wheatgrass, needleandthread, and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, pricklypear, rabbitbrush, and bottlebrush squirreltail increase. Range seeding is suitable if the range is in poor condition.

The Rizozo soil is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope. The Neville soil is well suited to homesite development.

The capability classification is VIIe, nonirrigated. The unit is about 60 percent in the Pinyon-Juniper woodland site and 40 percent in the Loamy Foothill #202 range site.

94—Rizozo-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on mountainsides and cuestas. The native vegetation is mainly pinyon and juniper. Elevation is 5,500 to 6,700 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 120 to 150 days.

This unit is about 70 percent Rizozo soil and 20 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of the deep Cascajo soils on foot slopes and along major drainageways. These soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit. Also included are areas of the deep Neville soils in drainageways. These soils have a surface layer of fine sandy loam. They make up about 5 percent of the unit.

The Rizozo soil is shallow and well drained. It formed in residuum derived dominantly from red sandstone. Slopes range from 15 to 30 percent. The surface layer is typically weak red channery loam about 3 inches thick. The substratum is pale red loam about 10 inches thick. Sandstone bedrock is at a depth of about 13 inches. The soil is moderately alkaline.

Permeability is moderate in the Rizozo soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Rock outcrop consists of sandstone. It occurs as small ledges and low, fragmented protrusions. Slopes range from 20 to 45 percent.

Most areas of this unit are used as noncommercial woodland, for wildlife habit, or for livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly pinyon and juniper and an understory of sideoats grama, blue grama, and Scribner needlegrass. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, red threeawn, yucca, broom snakeweed, and other forbs and shrubs increase.

Woodland products, such as firewood, transplants, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. The average pinyon-juniper site class is about 45. The slope limits access to pinyon and juniper. The use of tree spades for removal of transplants is severely limited by the depth to bedrock. Removing pinyon and juniper increases the production of understory forage. Range seeding should be combined with removal of the overstory. Broadcast seeding generally is necessary because of the slope and the Rock outcrop. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Rizozo soil is in the Pinyon-Juniper woodland site.

95—Rock outcrop. This map unit is on steep mountainsides. It is mainly barren. The native vegetation is mainly scattered scrubby conifers or woody shrubs that grow in very shallow pockets of soil. Elevation is 6,000 to 11,000 feet. The average annual precipitation is 12 to 25 inches, the average annual air temperature is 38 to 50 degrees F, and the average frost-free period is 50 to 130 days.

This unit is about 85 percent Rock outcrop and 10 percent rubble land. The rubble land is in areas below rock cliffs.

Included in mapping are areas that have shallow pockets of soil. These areas make up about 5 percent of the unit. A delineation in sec. 14 and sec. 22, T. 17 S., R. 68 W., is mainly rubble land.

The Rock outcrop consists of exposures of sedimentary, metamorphic, or igneous rocks. It occurs as cliffs, crags, ledges, and bouldery knobs.

This unit is used for wildlife habitat or for recreation.

The capability classification is VIIIs.

96—Rogert very gravelly sandy loam, warm, 10 to 40 percent south slopes. This shallow, well drained soil is on mountainsides and hills. It formed in residuum derived dominantly from granite and granodiorite. In some areas, such as Hayden Baldy Mountain near Coaldale, it formed in material weathered from sandstone. The native vegetation is mainly grasses and scrubs. Elevation is 8,000 to 9,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically grayish brown very gravelly sandy loam about 5 inches thick. The substratum is extremely gravelly sandy loam about 12 inches thick. Hard granodiorite is at a depth of about 17 inches. The soil is neutral. In places the surface layer is very cobbly sandy loam. In some areas in western Fremont County, the soil is channery, has a thin, clayey subsoil, and formed in material weathered from sandstone.

Included with this soil in mapping are areas of Guffey soils on foot slopes. These soils are moderately deep. They make up about 5 percent of the unit. Areas of the deep Adderton soils are on foot slopes. These soils have a surface layer of loam. They make up about 5 percent of the unit. Also included are areas of rock outcrop in the steeper positions and on ridges. These areas make up about 5 percent of the unit.

Permeability is moderately rapid in the Rogert soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland.

The potential plant community is mainly mountain muhly, blue grama, Arizona fescue, Gambel oak, mountainmahogany, and scattered stands of ponderosa pine. Some pinyon is on steep, north-facing slopes. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the range deteriorates, blue grama, fringed sagebrush, broom snakeweed, and rabbitbrush increase.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Dry Shallow Pine #218 range site.

97—Rogert very gravelly sandy loam, warm, 15 to 40 percent slopes. This shallow, well drained soil is on mountainsides. It formed in residuum derived dominantly from granite and granodiorite. The native vegetation is mainly grasses and open or moderately dense stands of ponderosa pine. Small areas that support thin stands of ponderosa pine and Gambel oak are on north- and west-facing slopes. Elevation is 8,500 to 10,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically grayish brown very gravelly sandy loam about 5 inches thick. The substratum is extremely gravelly sandy loam about 12 inches thick. Hard granodiorite is at a depth of about 17 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Included with this soil in mapping are areas of Granile soils on short, north-facing side slopes and in drainageways. These soils are deep and support fir trees. They make up about 5 percent of the unit. Also included are areas of Adderton soils in drainageways and rock outcrop in the steeper areas. Adderton soils are deep. They have a surface layer of loam. They make up about 5 percent of the unit. Rock outcrop also makes up about 5 percent of the unit. Areas of soils that have a light-colored surface layer are also included. These soils support moderately dense or dense stands of ponderosa pine. They make up about 5 percent of the unit.

Permeability is moderately rapid in the Rogert soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland, for wildlife habitat, or for recreation.

The potential plant community is mainly mountain muhly, Arizona fescue, Parry oatgrass, and prairie junegrass and a thin overstory of ponderosa pine. The stands of ponderosa pine are moderately dense or dense and are on steep, north-facing slopes. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, needleandthread, blue grama, sedges, fringed sagebrush, and mountainmahogany increase.

This soil is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Shallow Pine #240 range site.

98—Roygorge very gravelly sandy clay loam, 25 to 50 percent slopes. This shallow, well drained soil is on mountainsides. It formed in residuum derived dominantly from gneiss and granite. It also formed in sandstone and quartz in the northern part of the unit. The native vegetation is mainly pinyon and juniper. Elevation is 6,200 to 6,900 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 120 to 150 days.

The surface is typically covered with a mat of partially decomposed pinyon and juniper litter about 1 inch thick. The surface layer is brown very gravelly sandy clay loam about 2 inches thick. The subsoil is very gravelly sandy clay loam about 10 inches thick. Fractured gneiss is at a depth of about 12 inches. The soil is neutral. In places the soil has a dark surface layer about 5 to 8 inches thick. In some areas the surface layer is very gravelly sandy loam or very cobbly sandy loam.

Included in mapping are areas of the deep Sedillo soils on foot slopes and in drainageways on side slopes. These soils have a surface layer of cobbly sandy loam. They make up about 5 percent of the unit. Also included are areas of rock outcrop in the steeper positions and Wages soils in ridge saddles and swales and on benches. Rock outcrop makes up about 5 percent of the unit. Wages soils are deep. They have a surface layer of loam. They make up about 5 percent of the unit.

Permeability is moderate in the Roygorge soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as noncommercial woodland or for wildlife habitat, recreation, or livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas. Forage is sparse, except on grassy benches and in drainageways.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, Gambel oak, snowberry, and true mountainmahogany. The site index for pinyon and juniper is generally about 50. If the condition of the understory deteriorates, red threeawn, blue grama, pricklypear, broom snakeweed, rabbitbrush, and other forbs and shrubs increase. The potential production of native understory vegetation in normal years is about 400 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and by the depth to bedrock. Generally, only the foot slopes and ridges are accessible. The slope limits harvesting in other areas. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Range seeding is feasible, but broadcast seeding generally is necessary because of the slope and the rock fragments in the surface layer.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

99—Sawfork very cobbly loam, 8 to 40 percent slopes. This deep, well drained soil is on side slopes of dissected fan terraces. It formed in colluvium and residuum derived dominantly from tuff and ash flow. The native vegetation is mainly grasses. Elevation is 8,900 to 9,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 80 days.

The surface layer is typically grayish brown very cobbly loam about 8 inches thick. The subsoil is about 6 inches of very cobbly clay loam over 8 inches of sandy clay loam. The upper 17 inches of the substratum is loam. The next part, to a depth of 48 inches, is sandy loam. The underlying material to a depth of 60 inches or more is highly compacted and somewhat cemented ash flow tuff. It can be broken into loamy textured material with some difficulty. The soil is neutral to a depth of 14 inches. It is mildly alkaline to a depth of 22 inches and is moderately alkaline below that depth.

Included in mapping are areas of soils that are similar to the Sawfork soil but are shallow or moderately deep to tuff. These soils make up about 5 percent of the unit. Also included are areas of rock outcrop. These areas make up about 5 percent of the unit.

Permeability is moderate in the Sawfork soil. Available water capacity also is moderate. Effective rooting depth is 40 to more than 60 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland.

The potential plant community is mainly mountain muhly, Arizona fescue, blue grama, and needleandthread. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, fringed sagebrush, and rabbitbrush increase. Grazing management should include measures that protect the soil from excessive erosion. Range seeding is suitable if the range is in poor condition. Mechanical treatment may not be practical because of the slope and cobbles on the surface.

If this soil is used for homesite development, the main limitation is the slope. The soil is poorly suited to this use in areas where the slope is more than about 15 percent.

The capability classification is VIe, nonirrigated. The soil is in the Dry Loamy Slopes #227 range site.

100—Sedillo cobbly sandy loam, 4 to 25 percent slopes. This deep, well drained soil is on fan terraces. It formed in calcareous, gravelly and cobbly alluvium. In several areas it formed in landslide deposits. The native vegetation is mainly grasses and scattered pinyon and juniper. Elevation is 5,700 to 6,800 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 130 to 160 days.

Typically, 20 to 50 percent of the surface is covered with pebbles, cobbles, and stones. The surface layer is brown cobbly sandy loam about 5 inches thick. The subsoil is very gravelly sandy clay loam about 4 inches thick. The underlying material to a depth of 60 inches or more is very gravelly sandy loam. The soil is mildly alkaline to a depth of 9 inches and is moderately alkaline below that depth. In some areas on landslide deposits, the surface is bouldery.

Included with this soil in mapping are areas of Rizozo soils on ridges and Neville soils on landslide deposits. Rizozo soils are shallow. They have a surface layer of channery loam. They make up about 10 percent of the unit. Neville soils have a surface layer of fine sandy loam and do not have a subsoil. They have a reddish hue. They make up about 5 percent of the unit.

Permeability is moderate in the Sedillo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is slight to very high.

This soil is used as rangeland, for wildlife habitat, or as noncommercial woodland.

The potential plant community is mainly scattered pinyon and juniper and an understory of needleandthread, blue grama, Scribner needlegrass, sideoats grama, and western wheatgrass. The average annual production of air-dry vegetation is about 850 pounds per acre. If the condition of the range deteriorates, red threeawn, blue grama, pricklypear, broom snakeweed, and other forbs and shrubs increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. The slope limits harvesting in a few areas. Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion.

This soil is suited to homesite development in areas where slopes are about 15 percent or less.

The capability classification is VIs, nonirrigated. The soil is in the Gravelly Foothill #214 range site.

101—Sedillo very gravelly loam, 1 to 5 percent slopes. This deep, well drained soil is on remnants of fan terraces that have been isolated by geological erosion into small mesas. It formed in alluvium derived dominantly from metamorphic and igneous rock. Individual areas are narrow and range from 5 to 20 acres in size. The native vegetation is mainly grasses and scattered pinyon and juniper. Elevation is 3,500 to 6,000 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 130 to 150 days.

The surface layer is typically brown very gravelly loam about 3 inches thick. The upper part of the subsoil is 3 inches of very gravelly clay loam over 14 inches of very gravelly loam. The lower 43 inches or more is very gravelly sandy loam. The soil has a high content of finely divided calcium carbonate below a depth of 6 inches. It is neutral to a depth of 6 inches and is moderately alkaline below that depth. The surface layer is very cobbly or very stony loam in about 20 percent of the unit, mainly along the outer edges of the mapped areas.

Included with this soil in mapping are areas of Kim soils in swales. These soils make up about 5 percent of the unit. They are not gravelly. Also included are small areas of soils that have a layer of loam about 10 to 30 inches deep over gravelly sandy loam.

Permeability is moderate in the Sedillo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This soil is used as rangeland.

The potential plant community is mainly blue grama, needleandthread, Scribner needlegrass, and pinyon. The average annual production of air-dry vegetation is about 850 pounds per acre. If the condition of the range deteriorates, red threeawn, blue grama, rabbitbrush, and broom snakeweed invade or increase. Range seeding is suitable if the range is in poor condition. Broadcast seeding generally is necessary because of cobbles and pebbles on the surface.

This soil is well suited to homesite development.

The capability classification is VIs, nonirrigated. The soil is in the Gravelly Foothill #214 range site.

102—Seitz gravelly fine sandy loam, 20 to 40 percent slopes. This deep, well drained soil is on north-facing mountainsides. It formed in alluvium and colluvium. The native vegetation is mainly conifers. Elevation is 8,200 to 11,500 feet. The average annual precipitation is 16 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

The surface is typically covered with a thin layer of partially decomposed needles, leaves, and twigs. The surface layer is pinkish gray gravelly fine sandy loam about 15 inches thick. The upper 9 inches of the subsoil is very gravelly clay loam. The next 10 inches is very cobbly clay. The underlying material to a depth of 60 inches or more is very cobbly sandy clay loam. The soil is neutral. In some areas the surface layer is very cobbly loam or very stony loam.

Included with this soil in mapping are areas of Larand soils on the upper part of side slopes. These soils have a surface layer of very gravelly fine sandy loam. They make up about 10 percent of the unit. They have less clay in the subsoil than the Seitz soil.

Permeability is slow in the Seitz soil. Available water capacity is moderate. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly Douglas-fir and some Engelmann spruce and an understory of mountain muhly, elk sedge, Kentucky bluegrass, buffaloberry, and common juniper. The potential production of native understory vegetation is about 250 pounds per acre.

This soil is suited to production of Douglas-fir. The site index for Douglas-fir is about 45. Harvesting some of the mature trees for sawtimber and thinning dense stands of the younger trees for use as poles increase the growth rate of the rest of the stand and increase the understory vegetation. The soil is suited to limited production of Christmas trees.

The slope limits felling, yarding, and road construction. Conventional harvesting methods generally are restricted to areas that have slopes of less than 30 percent. Measures that minimize erosion should be applied when landings, roads, and skid trails are established. Unless disturbed areas are carefully protected, the hazard of erosion is high. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIs, nonirrigated. The soil is in the Douglas-Fir woodland site.

103—Seitz-Bushvalley complex, 15 to 50 percent slopes. These soils are on mountainsides and ridges. The native vegetation is mainly conifers and grasses. Elevation is 8,600 to 9,600 feet. The average annual precipitation is 15 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 85 days.

This unit is about 65 percent Seitz soil and 20 percent Bushvalley soil. The Seitz soil is on side slopes, and the Bushvalley soil is on ridges.

Included in mapping are areas of soils that are similar to the Seitz soil but are moderately deep. These soils are on side slopes. They make up about 10 percent of the unit. Also included are areas of Tellura soils in open stands of ponderosa pine. Tellura soils are similar to the Seitz soil but have a thick, dark surface layer. They make up about 5 percent of the unit. Areas of rock outcrop are on ridges and the upper part of side slopes. These areas make up about 5 percent of the unit. Also included are areas of deep, clayey soils that have a low content of gravel. These soils are on landslide deposits in sec. 10, sec. 11, sec. 23, and sec. 24, T. 17 S., R. 73 W.

The Seitz soil is deep and well drained. It formed in colluvium derived dominantly from tuff and breccia. Slopes range from 15 to 45 percent. The surface is typically covered with a mat of pine and oak litter about 2 inches thick. The surface layer is dark grayish brown very stony loam about 2 inches thick. The subsurface layer is pinkish gray extremely stony loam about 6 inches thick. The subsoil is very cobbly clay loam about 52 inches thick. The soil is slightly acid. In some areas the surface layer is very gravelly loam or very cobbly loam.

Permeability is slow in the Seitz soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Bushvalley soil is shallow and well drained. It formed in residuum derived dominantly from tuff and breccia. Slopes range from 20 to 50 percent. The surface layer is typically dark grayish brown cobbly loam about 4 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. Breccia is at a depth of about 11 inches. The soil is neutral. In some areas the surface layer is very cobbly loam.

Permeability is moderately slow in the Bushvalley soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used as woodland, for livestock grazing, or for wildlife habitat. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community on the Seitz soil is mainly ponderosa pine and an understory of mountain muhly, elk sedge, Arizona fescue, and pine dropseed. The potential production of native understory vegetation is about 250 pounds per acre.

The potential plant community on the Bushvalley soil is mainly Arizona fescue, mountain muhly, Parry oatgrass, and needlegrass. Some areas have an open overstory of ponderosa pine or bristlecone pine. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, blue grama, true mountainmahogany, Gambel oak, and fringed sagebrush increase.

The Seitz soil is suited to production of ponderosa pine. The site index for ponderosa pine is generally about 55, but Gambel oak dominates the present site in some areas. Harvesting some of the mature trees for sawtimber and thinning dense stands of the younger trees for use as poles increase the growth rate of the rest of the stand and increase the understory vegetation.

The Seitz soil is suited to limited production of high-value Christmas trees, which may be an economically viable alternative to the production of sawtimber. Ornamental ponderosa pine can be grown in areas of the Seitz soil for transplanting. Stones in the soil interfere with the use of tree spades. Conventional harvesting methods generally are restricted to areas that have slopes of less than 30 percent. Stoniness of the surface limits felling and yarding in some areas.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. The hazard of erosion is moderate on well designed roads and in minimally disturbed areas. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings is about 25 to 50 percent. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This unit is poorly suited to homesite development. The main limitations are the slope and the slow permeability in the Seitz soil. The depth to bedrock also is a limitation in areas that are not wooded.

The capability classification is VIIs, nonirrigated. The unit is about 75 percent in the Ponderosa Pine woodland site and 25 percent in the Shallow Loam #230 range site.

104—Shanta loam, 0 to 3 percent slopes. This deep, well drained soil is on stream terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,800 to 6,300 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 120 to 140 days.

The surface layer and the subsoil are typically brown loam about 49 inches thick. The substratum to a depth of 60 inches or more is stratified sandy loam and loamy sand. The soil is mildly alkaline to a depth of 2 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Cascajo soils adjacent to stream channels. These soils make up about 10 percent of the unit. They are mainly sand, gravel, and cobbles. Also included are areas of wet, very poorly drained soils bordering stream channels. These soils make up about 5 percent of the unit.

About 80 acres along Fourmile Creek, in sections 21 to 28, T. 17 S., R. 70 W., contains mainly wet, very poorly drained soils. The soils mostly have a surface layer of grayish brown sandy loam about 5 inches thick over 7 inches of loamy sand. The substratum to a depth of 60 inches or more is very gravelly loamy coarse sand that has nearly continuous, strong brown mottles.

Permeability is moderate in the Shanta soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to rare, very brief periods of flooding from April through September.

Most areas of this soil are used for irrigated pasture and hay. A few areas are used as rangeland or for nonirrigated pasture.

The potential plant community is mainly western wheatgrass, blue grama, prairie junegrass, and needleandthread. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. The seedbed should be prepared on the contour or across the slope where practical. Irrigation water can be applied by contour ditches and corrugation. It should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, this soil can produce 5 tons of irrigated alfalfa hay per acre.

This soil is poorly suited to homesite development. The main concern is the rare flooding. Areas on low stream terraces adjacent to the stream channels are subject to more frequent flooding.

The capability classification is IIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

105—Shanta loam, dry, 0 to 3 percent slopes. This deep, well drained soil is on stream terraces. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 5,000 to 5,300 feet. The average annual precipitation is 11 or 12 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 140 to 165 days.

The surface layer is typically grayish brown loam about 27 inches thick. The substratum to a depth of 60 inches or more is stratified sandy clay loam, loam, and silty clay loam. The soil is mildly alkaline to a depth of 48 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of poorly drained soils adjacent to stream channels. These soils have a surface layer of fine sandy loam. They make up about 10 percent of the unit. Also included are areas of well drained soils that generally have sandy loam in the upper 40 inches. These soils make up about 5 percent of the unit.

Permeability is moderate in the Shanta soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is generally subject to rare, very brief periods of flooding from April through September. Some areas in the town of Florence are not subject to flooding because of the higher elevation or because of flood-protection measures.

Most areas of this soil are used as irrigated cropland. A few areas are used for urban development. Hay and pasture are the main irrigated crops. A few areas on the west side of Florence are used for vegetables or corn for silage.

The potential plant community is mainly blue grama, western wheatgrass, little bluestem, and Indian ricegrass. The average annual production of air-dry vegetation is about 1,400 pounds per acre.

This soil is well suited to irrigated crops. Irrigation water can be applied by furrow, corrugation, sprinklers, or flooding from contour ditches. Adjusting the applications of water to the available water capacity, the water intake rate, and the needs of the crop helps to prevent overirrigating and the leaching of plant nutrients. In a few areas, the water table rises to a depth of about 20 to 30 inches for brief periods in early summer. The water table provides beneficial subirrigation for deep-rooted crops.

Nonleguminous crops respond to applications of nitrogen and phosphorus, and leguminous crops respond to applications of phosphorus. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate. If properly managed, this soil can produce 6 tons of irrigated alfalfa hay and 26 tons of corn silage per acre.

This soil is well suited to homesite development in areas where flood protection is provided.

The capability classification is IIe, irrigated, and VIc, nonirrigated. The soil is in the Overflow #36 range site.

106—Shanta-Nederland association. These soils are on stream terraces and fan terrace edges. The native vegetation is mainly grasses and oak brush on terrace edges. Elevation is 5,700 to 5,900 feet. The average annual precipitation is 14 or 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 130 to 150 days.

This unit is about 70 percent Shanta soil and 15 percent Nederland soil. The Shanta soil is on stream terraces, and the Nederland soil is on the edges of short, steep fan terraces.

Included with these soils in mapping are areas of Wiley soils on adjacent upland foot slopes and somewhat poorly drained soils near stream channels. Wiley soils are seeped. They have a surface layer of loam. They make up about 5 percent of the unit. The somewhat poorly drained soils also make up about 5 percent of the unit. They are on all of the stream terraces along Mineral Creek in sec. 28, sec. 33, and sec. 34, T. 20 S., R. 69 W. Also included are areas of Cascajo soils on the crest of terrace edges. These soils make up about 5 percent of the unit. They are mainly sand and gravel. In a few areas near stream channels, nests of stones and cobbles are on the surface.

The Shanta soil is deep and well drained. It formed in alluvium derived dominantly from granitic rocks. Slopes range from 1 to 4 percent. The surface layer is typically grayish brown loam about 12 inches thick. The substratum to a depth of 60 inches or more is mainly dark grayish brown fine sandy loam, but in some areas it has strata of loam. The soil is mildly alkaline to a depth of 12 inches and is moderately alkaline below that depth.

Permeability is moderate in the Shanta soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The seasonal high water table is at a depth of 72 to 90 inches in the spring. The soil is subject to rare, very brief periods of flooding from April through September.

The Nederland soil is deep and well drained. It formed in alluvium derived dominantly from granitic and sedimentary rock. Slopes range from 20 to 45 percent. The surface layer is typically brown extremely cobbly sandy loam about 8 inches thick. The subsoil is extremely cobbly sandy clay loam about 23 inches thick. The substratum to a depth of 60 inches or more is extremely cobbly sandy loam. The soil is neutral.

Permeability is moderate in the Nederland soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high or very high.

This unit is used as rangeland. A few small areas of the Shanta soil are used for irrigated hay and pasture.

The potential plant community on the Shanta soil is mainly western wheatgrass, blue grama, prairie junegrass, and needlegrass. Areas along the stream channels support some cottonwoods. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, blue grama, broom snakeweed, red threeawn, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

The potential plant community on the Nederland soil is mainly needleandthread, little bluestem, blue grama, sideoats grama, mountain muhly, and Gambel oak. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, Gambel oak, red threeawn, and rabbitbrush increase. Range seeding is feasible, but broadcast seeding generally is necessary because of the surface stoniness and the slope.

Important management concerns in areas used for irrigated hay and pasture are the hazard of erosion and the efficient application of irrigation water. The seedbed should be prepared on the contour or across the slope where practical. In the more sloping areas, leveling is needed for the efficient application and removal of irrigation water. Irrigation water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion. Fertilizer is needed to ensure the optimum growth of grasses and legumes. If properly managed, these soils can produce 5 tons of irrigated alfalfa hay per acre.

The Shanta soil is poorly suited to homesite development. The main concern is the rare flooding. The use of conventional septic tank absorption fields can contaminate ground water, which is at a depth of 6 to 8 feet during most of the year. The Nederland soil is poorly suited to homesite development. The main limitation is the slope.

The capability classification of the Shanta soil is IIe, irrigated, and IVe, nonirrigated. The capability classification of the Nederland soil is VIIs, nonirrigated. The unit is about 80 percent in the Loamy Foothill #202 range site and 20 percent in the Cobbly Foothill #213 range site.

107—Shingle very cobbly sandy loam, 10 to 40 percent slopes. This shallow, well drained soil is on the side slopes of isolated remnants of fan terraces. It formed in residuum derived dominantly from sandstone and shale. The native vegetation is mainly grasses and scattered juniper. Elevation is 5,300 to 5,500 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 160 days.

The surface layer is typically brown very cobbly sandy loam about 4 inches thick. The substratum is loam about 13 inches thick. Weathered shale is at a depth of about 17 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of Cascajo soils along crests of side slopes and Travessilla soils near ledges and cliffs. Cascajo soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit. Travessilla soils have a surface layer of channery sandy loam. They make up about 5 percent of the unit. Also included are areas of sandstone rock outcrop on side slopes. These areas make up about 5 percent of the unit. They are small areas of nearly vertical and vertical cliffs and ledges. Travessilla soils are dominant in sec. 6, T. 19 S., R. 69 W.

Permeability is moderate in the Shingle soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland.

The potential plant community is mainly sideoats grama, little bluestem, needleandthread, blue grama, and Indian ricegrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, red threeawn, pricklypear, and annual forbs increase.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Gravel Breaks #64 range site.

108—Shingle loam, 3 to 20 percent slopes. This shallow, well drained soil is on plains and foot slopes. It formed in residuum derived dominantly from interbedded sandstone and shale. The native vegetation is mainly grasses. Elevation is 5,100 to 5,600 feet. The average annual precipitation is 11 to 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 170 days.

The surface layer is typically light gray loam about 6 inches thick. The substratum is clay loam about 7 inches thick. Weathered shale is at a depth of about 13 inches. The soil is moderately alkaline. It has a high content of gypsum crystals in a few areas. In some areas about 20 percent of the surface is covered by small, channery sandstone fragments. In a few areas the surface layer is gravelly loam.

Included with this soil in mapping are Midway soils in the lower areas. These soils make up about 5 percent of the unit. They are more clayey than the Shingle soil. They are green-gray in color. Also included are areas of the moderately deep Minnequa soils in swales and on foot slopes. These soils have a surface layer of silt loam. They make up about 5 percent of the unit. Small areas of shale outcrop are on the steeper breaks.

Permeability is moderate in the Shingle soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is slow to very rapid, and the hazard of water erosion is slight to very high.

This soil is used as rangeland.

The potential plant community is mainly alkali sacaton, blue grama, western wheatgrass, and sideoats grama. The average annual production of air-dry vegetation is about 550 pounds per acre. If the condition of the range deteriorates, blue grama, fourwing saltbush, frank bush, and red threeawn increase. Range seeding is suitable if the range is in poor condition. Grazing management should include measures that protect the soil from excessive erosion.

If this soil is used for homesite development, the main limitations are the depth to shale and a moderate shrink-swell potential. Although the upper part of the bedrock can generally be excavated with a light backhoe, the soil is poorly suited to dwellings with basements and to use as a site for septic tank absorption fields.

The capability classification is VIe, nonirrigated. The soil is in the Shaly Plains #46 range site.

109—Shrine loam, 2 to 8 percent slopes. This deep, well drained soil is on fan terraces and fans. It formed in alluvium. The native vegetation is mainly grasses. Elevation is 6,800 to 8,000 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

The surface layer is typically brown loam about 10 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is moderately alkaline. In some areas on moderately sloping fans, the surface layer is gravelly loam.

Included with this soil in mapping are the poorly drained Aquolls in low areas adjacent to perennial stream channels. These soils make up about 5 percent of the unit.

Permeability is moderate in the Shrine soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight to high.

This soil is used mainly for irrigated hay and pasture. It also is used as rangeland. A mixture of brome and alfalfa is commonly grown.

The potential plant community is mainly blue grama, western wheatgrass, needleandthread, little bluestem, and Indian ricegrass. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, broom snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to irrigated crops. The choice of crops is limited mainly to hay, pasture, and small grain because of the short growing season. If properly managed, this soil can produce 4.5 tons of irrigated alfalfa hay per acre.

Irrigation water can be applied by corrugation, by flooding from contour ditches, or by sprinklers. In the more sloping areas, leveling is needed for the efficient application and removal of irrigation water. Irrigation water should be applied at a rate that ensures optimum production without increasing deep percolation, the runoff rate, or the hazard of erosion.

Proper grazing practices, weed control, and applications of fertilizer help to ensure the maximum quality of forage. The seedbed should be prepared on the contour or across the slope where practical. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

This soil is well suited to homesite development.

The capability classification is IIIe, irrigated, and IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

110—Swissvale-Rentsac complex, 20 to 55 percent slopes. These soils are on steep mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 7,300 to 8,400 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

This unit is about 45 percent Swissvale soil and 35 percent Rentsac soil. The Swissvale soil is in all areas of the unit but is dominantly on north- or west-facing side slopes. The Rentsac soil is mainly on south- or east-facing side slopes.

Included with these soils in mapping are areas of sandstone and siltstone rock outcrop in the steeper positions. These areas make up about 10 percent of the unit. Rock outcrop occurs as low ledges. Areas of the deep Bronell soils are on foot slopes and along drainageways. Bronell soils have a surface layer of gravelly sandy loam. They make up about 10 percent of the unit. Also included are a few very small areas, commonly about one-third acre in size, of nearly barren gypsum land. Areas of soils that are similar to the Swissvale soil but are moderately deep are also included. These soils are on north-facing side slopes.

The Swissvale soil is shallow and well drained. It formed in residuum derived dominantly from interbedded sandstone and siltstone. The surface layer is typically grayish brown very gravelly sandy loam about 2 inches thick. The subsoil is mainly very gravelly clay loam about 7 inches thick. Weathered siltstone is at a depth of 9 inches. Hard, fractured siltstone is at a depth of about 19 inches. The soil is neutral to a depth of 5 inches and is mildly alkaline below that depth.

Permeability is moderate in the Swissvale soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Rentsac soil is shallow and well drained. It formed in residuum derived dominantly from interbedded sandstone and siltstone. The surface layer is typically grayish brown very channery loam about 3 inches thick. The substratum is extremely channery loam about 5 inches thick. Weathered sandstone bedrock is at a depth of about 8 inches. Hard sandstone bedrock is at a depth of about 14 inches. The soil is moderately alkaline.

Permeability is moderately rapid in the Rentsac soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used as noncommercial woodland, for wildlife habitat, or for recreation.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and mountainmahogany. The potential production of native understory vegetation in normal years is about 250 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, lambsquarters, pricklypear, and yucca increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. However, the steep and rough terrain limits access to these products. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and by the depth to bedrock.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. If areas of this unit are harvested, measures that protect the soils on steep slopes from erosion are needed. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Range seeding is feasible, but broadcast seeding generally is necessary because of the slope. Suitable seeding mixtures include adapted wheatgrass, Russian wildrye, and blue grama. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The unit is in the Pinyon-Juniper woodland site.

111—Teaspoon very gravelly sandy loam, 15 to 45 percent slopes. This shallow, well drained soil is on mountainsides and hogbacks. It formed in residuum derived dominantly from sandstone and granite. The native vegetation is mainly pinyon and juniper. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 95 to 115 days.

The surface layer is typically brown very gravelly sandy loam about 4 inches thick. The subsoil is very gravelly sandy clay loam about 7 inches thick. Hard sandstone is at a depth of about 11 inches. The soil is slightly acid to a depth of 7 inches and is neutral below that depth. In some areas the surface layer is very channery sandy loam.

Included with this soil in mapping are areas of the deep Bronell and Kerhayden soils on foot slopes and along drainageways. These soils have a surface layer of gravelly sandy loam. Bronell soils make up about 10 percent of the unit. Kerhayden soils make up about 5 percent of the unit. They have a low content of gravel. Also included are areas of the deep Larand soils along drainageways. These soils support fir and aspen. They make up about 5 percent of the unit.

This soil is used as noncommercial woodland, for wildlife habitat, or for recreation.

Permeability is moderate in the Teaspoon soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, blue grama, and true mountainmahogany. If the condition of the understory deteriorates, blue grama, red threeawn, and forbs and shrubs increase. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

Woodland products, such as firewood, transplants, and pinyon nuts, are produced in areas of this soil. In some areas, however, the slope limits access to these products. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and the depth to bedrock. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

112—Tecolote very gravelly sandy loam, 15 to 40 percent slopes. This deep, well drained soil is on fan terrace edges along drainageways. It formed in alluvium. The native vegetation is mainly ponderosa pine. Elevation is 6,300 to 6,600 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 43 to 46 degrees F, and the average frost-free period is 110 to 130 days.

The surface is typically covered with a mat of partially decomposed ponderosa pine and Gambel oak litter about 2 inches thick. The surface layer is dark grayish brown very gravelly sandy loam about 3 inches thick. The subsurface layer is pale brown very gravelly coarse sandy loam about 6 inches thick. The upper 32 inches of the subsoil is extremely gravelly sandy clay loam. The lower 19 inches is extremely gravelly coarse sandy loam. The soil is neutral.

Included with this soil in mapping are areas of Bronell soils on south-facing slopes and Shrine soils along drainageways. These soils have a thicker dark surface layer than the Tecolote soil. Bronell soils have a surface layer of gravelly sandy loam. They support pinyon and juniper. They make up about 10 percent of the unit. Shrine soils have a surface layer of loam. They make up about 5 percent of the unit. Also included are areas of soils that have a stony surface layer and a low content of rock fragments. These soils are in delineations in sec. 23, T. 20 S., R. 70 W.

Permeability is moderate in the Tecolote soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used for livestock grazing or wildlife habitat. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly ponderosa pine and an understory of mountain muhly, Scribner needlegrass, pine dropseed, and Gambel oak. The potential production of native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, fringed sagebrush, blue grama, Gambel oak, and true mountainmahogany increase.

This soil is suited to ponderosa pine. The site index for ponderosa pine is about 50. Some areas have a thick stand of Gambel oak and an overstory of scattered ponderosa pine. The use of tree spades for the removal of ornamental ponderosa pine transplants is severely limited by the high content of rock fragments in the soil.

This soil is poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. The soil is in the Ponderosa Pine woodland site.

113—Tecolote very cobbly sandy loam, 5 to 20 percent slopes. This deep, well drained soil is on fan terraces and moraines. It formed in glacial till and outwash. The native vegetation is mainly ponderosa pine. Elevation is 7,500 to 8,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 70 to 90 days.

The surface is typically covered with a mat of needles and twigs about 1 inch thick. The surface layer is brown very cobbly sandy loam about 15 inches thick. The subsoil is extremely gravelly sandy clay loam about 26 inches thick. The substratum to a depth of 60 inches or more is extremely gravelly sandy loam. The soil is neutral.

Included with this soil in mapping are areas of Aquolls along drainageways. These soils make up about 5 percent of the unit. They have a seasonal high water table. Also included are areas of soils that have a substratum of extremely gravelly loamy sand.

Permeability is moderate in the Tecolote soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high.

This soil is used as woodland or for wildlife habitat, recreation, or livestock grazing.

The potential plant community is mainly ponderosa pine and some aspen and fir and an understory of Arizona fescue, mountain muhly, and Gambel oak. A few areas are dominated by Gambel oak, pinyon, or juniper. If the condition of the understory deteriorates, blue grama, Gambel oak, and undesirable forbs increase. The potential production of native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre.

This soil is suited to production of ponderosa pine. The site index for ponderosa pine is about 60. Harvesting some of the mature trees for sawtimber and thinning dense stands of the younger trees for use as poles increase the growth rate of the rest of the stand and increase the understory vegetation. The soil is suited to limited production of high-value Christmas trees, which may be a viable alternative to the production of sawtimber. Ornamental ponderosa pine can be grown in areas of this soil for transplanting. Cobbles in the soil interfere with the use of tree spades.

The main limitation affecting woodland is the low available water capacity. Conventional methods of harvesting timber can be used. Stoniness of the surface can interfere with felling, yarding, and other operations involving the use of equipment.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Generally, the hazard of erosion is slight on well designed roads and in minimally disturbed areas. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees.

Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

Because of the high content of rock fragments, planting seedlings is difficult. If plant competition is not a limitation, the mortality rate of 2-year-old seedlings generally is about 25 percent. It is less than 25 percent on some north-facing slopes. The planting techniques used and local variations in climate greatly influence seedling survival. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is well suited to homesite development, except in areas where the slope is more than about 15 percent. Conventional septic tank absorption fields function adequately, but ground water may be polluted because of the rapid permeability in the lower part of the soil, particularly in areas near stream channels. Because of the high content of rock fragments, excavation is difficult.

The capability classification is VIIs, nonirrigated. The soil is in the Ponderosa Pine woodland site.

114—Tellura gravelly clay loam, 4 to 25 percent slopes. This deep, well drained soil is on fans and fan terraces. It formed in alluvium and residuum derived dominantly from andesitic and basaltic breccia. The native vegetation is mainly grasses. Elevation is 9,000 to 9,600 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

The surface layer is typically very dark gray gravelly clay loam about 13 inches thick. The upper 9 inches of the subsoil is very gravelly clay. The lower 26 inches is very gravelly sandy clay. The substratum to a depth of 60 inches or more is extremely gravelly sandy clay loam. The soil is slightly acid to a depth of 13 inches. It is neutral to a depth of 48 inches and is mildly alkaline below that depth. In some small areas the surface layer is very cobbly. These areas are on the steeper side slopes and narrow ridgetops and in small nests and stringers on terrace tops.

Included with this soil in mapping are areas of Adderton soils in narrow swales. These soils make up about 5 percent of the unit. They are less clayey than the Tellura soil and have a thicker dark surface layer. Also, they do not have a developed subsoil. Also included are areas of the very poorly drained Cumulic Cryaquolls in swales. These soils make up about 5 percent of the unit.

Permeability is slow in the Tellura soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to very rapid, and the hazard of water erosion is moderate to very high.

This soil is used as rangeland.

The potential plant community is mainly Arizona fescue, mountain muhly, Parry oatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, western wheatgrass, slimstem muhly, fringed sagebrush, and pingue increase. Range seeding is suitable if the range is in poor condition.

If this soil is used for homesite development, the main limitations are a moderate shrink-swell potential, the slow permeability, and slopes that are more than about 15 percent. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling the excavation with material that has a low shrink-swell potential can also reduce the effects of shrinking and swelling. Conventional septic tank absorption fields do not function adequately because of the slow permeability. Other types of sewage disposal systems may be needed.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

115—Tolex very gravelly sandy loam, 15 to 40 percent slopes. This shallow, well drained soil is on mountainsides. It formed in residuum derived dominantly from gneiss. The native vegetation is mainly ponderosa pine. At the lower elevations, Gambel oak commonly dominates the site. Elevation is 8,000 to 9,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free period is 75 to 95 days.

The surface is typically covered with a mat of pine litter about 1 inch thick. The surface layer is grayish brown very gravelly sandy loam about 2 inches thick. The subsurface layer is extremely gravelly sandy loam about 5 inches thick. The subsoil is extremely gravelly sandy clay loam about 10 inches thick. Fractured gneiss is at a depth of about 17 inches. The soil is slightly acid. In some areas the surface is stony or cobbly.

Included with this soil in mapping are areas of the moderately deep Lakehelen soils on the lower part of side slopes. These soils have a surface layer of very stony fine sandy loam. They make up about 5 percent of the unit. Also included are areas of the deep Jodero soils on foot slopes and drainageways. These soils have a surface layer of sandy loam. They make up about 5 percent of the unit. Areas of rock outcrop are on ridges and in the steeper areas. These areas make up about 5 percent of the unit. Rock outcrop generally occurs as small, jagged knobs and ledges.

Permeability is moderate in the Tolex soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This soil is used as woodland or for wildlife habitat, recreation, or livestock grazing. The slope limits access by livestock, and thus overgrazing is a concern in the less sloping areas.

The potential plant community is mainly ponderosa pine and some pinyon and Douglas-fir and an understory of sedges, muttongrass, Arizona fescue, Gambel oak, mountainmahogany, snowberry, and pine dropseed. Many areas are dominated by Gambel oak and have an overstory of scattered pine. The potential production of native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre.

This soil is suited to production of ponderosa pine. The site index for ponderosa pine is about 50. The main concerns in producing and harvesting timber are the low available water capacity, the slope, and the depth to bedrock. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and the depth to bedrock.

Minimizing the risk of erosion is essential when timber is harvested. Properly designing road drainage systems and carefully placing culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Installing water bars on roads, landings, and skid trails and reseeding after harvest help to stabilize grades, cuts and fills, and other disturbed areas. Suitable seeding mixtures include sideoats grama, blue grama, and pubescent wheatgrass. Chiseling or otherwise disturbing the surface helps to provide an adequate seedbed. Seeding late in fall helps to ensure that soil moisture will be adequate for the establishment of seedlings in spring.

The hazard of erosion is generally low on well designed roads and in minimally disturbed areas. Leaving organic litter on the surface helps to maintain a high rate of water infiltration, control runoff, and maintain an adequate source of nutrients for trees.

Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Because of the high content of rock fragments, planting seedlings is difficult. The planting techniques used and local variations in climate greatly influence seedling survival.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Ponderosa Pine woodland site.

116—Tolex-Larkson complex, warm, 25 to 50 percent slopes. These soils are on foot slopes below sandstone escarpments. The native vegetation is mainly Gambel oak and scattered ponderosa pine. Elevation is 7,000 to 7,500 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 100 to 120 days.

This unit is about 45 percent Tolex soil and 40 percent Larkson soil. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of talus at the base of escarpments. These areas make up about 10 percent of the unit. Also included are areas of rock outcrop. These areas make up about 5 percent of the unit. Rock outcrop occurs as long sandstone escarpments at the top of slopes.

The Tolex soil is shallow and well drained. It formed in residuum derived dominantly from sandstone and siltstone. Slopes range from 30 to 50 percent. The surface is typically covered with a mat of undecomposed Gambel oak litter about 1 inch deep over highly decomposed litter. The surface layer is grayish brown very channery sandy loam about 5 inches thick. The subsurface layer is pale brown very channery sandy loam about 5 inches thick. The subsoil is extremely channery sandy clay loam about 14 inches thick. Fractured sandstone is at a depth of about 19 inches. The soil is neutral.

Permeability is moderate in the Tolex soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Larkson soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Slopes range from 25 to 40 percent. The surface is typically covered with a mat of Gambel oak litter about 2 inches thick. The surface layer is dark grayish brown stony loam about 4 inches thick. The subsurface layer is pale brown gravelly fine sandy loam about 4 inches thick. The upper 17 inches of the subsoil is clay loam. The lower 15 inches is silty clay loam. The substratum to a depth of 60 inches or more is silt loam. The soil is neutral.

Permeability is slow in the Larkson soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used for wildlife habitat or limited livestock grazing. Access by livestock is limited because of the slope and thick brush.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, muttongrass, Gambel oak, mountainmahogany, and snowberry. The potential production of native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre.

This unit is suited to production of ponderosa pine. The site index for ponderosa pine is about 40.

These soils are poorly suited to homesite development. The main limitations on the Tolex soil are the slope and the depth to bedrock. The main limitations on the Larkson soil are the slope, the slow permeability, and a high shrink-swell potential.

The capability classification is VIIe, nonirrigated. The unit is in the Ponderosa Pine woodland site.

117—Travessilla channery loam, 5 to 20 percent slopes. This shallow, well drained soil is on cuestas. It formed in residuum derived dominantly from sandstone. The native vegetation is mainly pinyon and juniper. Elevation is 5,300 to 6,800 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 120 to 150 days.

The soil is typically channery loam about 14 inches deep over sandstone. The soil is moderately alkaline.

Included with this soil in mapping are areas of the very gravelly Sedillo soils and Kim soils along drainageways. These soils are deep. Sedillo soils make up about 5 percent of the unit. Kim soils also make up about 5 percent of the unit. Also included are areas of soils that are similar to the Travessilla soil but are 20 to 40 inches thick. These soils make up about 5 percent of the unit. They are intermingled with the Travessilla soil on broad cuesta tops.

Permeability is moderate in the Travessilla soil. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used as noncommercial woodland, for wildlife habitat, or for livestock grazing.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, sideoats grama, blue grama, Gambel oak, and mountainmahogany. The potential production of native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, red threeawn, sand dropseed, pricklypear, and yucca increase. In several large areas, the pinyon and juniper have been chained. The surface cover in these areas is presently dominated by grasses.

Woodland products, such as firewood and pinyon nuts, are produced in areas of this soil. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitation is the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

118—Travessilla-Rock outcrop complex, 5 to 50 percent slopes. This map unit is on canyonsides, hogbacks, and cuestas. The native vegetation is mainly pinyon and juniper. Elevation is 5,300 to 6,800 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 120 to 150 days.

This unit is about 55 percent Travessilla soil and 30 percent Rock outcrop. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in mapping are areas of the clayey Louviers soils in narrow bands over shale. These soils are shallow. They make up about 10 percent of the unit. Also included are areas of the deep Kim soils. These soils have a surface layer of loam. They make up about 5 percent of the unit. On foot slopes and along drainageways are soils that are similar to the Travessilla soil but are noncalcareous throughout.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Slopes range from 5 to 50 percent. The surface layer is light brownish gray channery sandy loam about 4 inches thick. The substratum is sandy loam about 5 inches thick. Sandstone bedrock is at a depth of 9 inches. The soil is mildly alkaline to a depth of 4 inches and is moderately alkaline below that depth. In some areas the surface layer is channery loam.

Permeability is moderately rapid in the Travessilla soil. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

The Rock outcrop consists of calcareous or noncalcareous sandstone. It occurs as cliffs about 15 to 30 feet high and low ledges about 1 to 6 feet high. In many areas, only the surface of the bedrock is exposed. Slopes range from 10 to 50 percent.

This unit is used as noncommercial woodland or for wildlife habitat. In some areas the slope limits access by livestock.

The potential plant community is mainly pinyon and juniper and an understory of Scribner needlegrass, sideoats grama, blue grama, little bluestem, Gambel oak, and mountainmahogany. The potential production of native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, red threeawn, pricklypear, and shrubs increase.

Woodland products, such as firewood and pinyon nuts, are produced in areas of this unit. The stands of pinyon and juniper are generally open, and the trees are small. The slope limits access in some areas. The use of tree spades for removal of transplants is severely limited by the depth to bedrock.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion. Range seeding is feasible, but broadcast seeding generally is necessary because of the depth to bedrock and the Rock outcrop. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This unit is poorly suited to homesite development. The main limitations are the depth to bedrock and the slope.

The capability classification is VIIs, nonirrigated. The Travessilla soil is in the Pinyon-Juniper woodland site.

119—Troutdale-Rogert, warm, complex, 2 to 15 percent slopes. These soils are on ridges and side slopes in intermontane parks. The native vegetation is mainly grasses and scattered pinyon pine. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 70 to 90 days.

This unit is about 65 percent Troutdale soil and 20 percent Rogert soil. The Troutdale soil is mainly in grassy, concave areas. The Rogert soil is on hills and ridges.

Included with these soils in mapping are areas of the deep Adderton soils in swales. Adderton soils make up about 10 percent of the unit. Also included are areas of granite or gneiss rock outcrop. Generally, the bedrock is only slightly exposed on the surface. Rock outcrop makes up about 5 percent of the unit.

The Troutdale soil is moderately deep and is well drained. It formed in alluvium over residuum derived dominantly from schist and gneiss. Slopes range from 2 to 15 percent. The surface layer is typically dark grayish brown loam about 7 inches thick. The subsoil is sandy clay loam about 15 inches thick. Soft, weathered schist is at a depth of about 22 inches. The soil is neutral to a depth of 14 inches and is mildly alkaline below that depth.

Permeability is moderate in the Troutdale soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow to rapid, and the hazard of water erosion is slight to high.

The Rogert soil is shallow and well drained. It formed in residuum derived dominantly from gneiss and granite. Slopes range from 5 to 15 percent. The surface layer is typically grayish brown very gravelly sandy loam about 5 inches thick. The substratum is extremely gravelly sandy loam about 12 inches thick. Gneiss is at a depth of about 17 inches. The soil is neutral.

Permeability is moderately rapid in the Rogert soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This unit is used as rangeland.

The potential plant community on the Troutdale soil is mainly needleandthread, western wheatgrass, Arizona fescue, mountain muhly, and blue grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, sleepygrass, blue grama, broom snakeweed, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

The potential plant community on the Rogert soil is mainly mountain muhly, blue grama, Arizona fescue, Gambel oak, and some ponderosa pine. The average annual production of air-dry vegetation is about 600 pounds per acre. If the condition of the understory deteriorates, red threeawn, pricklypear, blue grama, and yucca increase.

The Troutdale soil is well suited to homesite development. It is not suited to use as a site for conventional septic tank absorption fields. The Rogert soil is poorly suited to homesite development because of the depth to bedrock.

The capability classification is VIe, nonirrigated. The unit is about 75 percent in the Mountain Loam, 13- to 18-inch precipitation zone #226 range site and 25 percent in the Dry Shallow Pine #218 range site.

120—Ustic Torriorthents, bouldery-Rock outcrop complex, 35 to 90 percent slopes. This map unit is on mountainsides. The native vegetation is mainly pinyon and juniper. Elevation is 6,800 to 8,500 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 47 degrees F, and the average frost-free period is 95 to 120 days.

This unit is about 55 percent Ustic Torriorthents, bouldery, and 30 percent Rock outcrop. The components are intermingled on side slopes.

Included in mapping are areas of the deep Cascajo Variant and Bronell soils on foot slopes. Cascajo Variant soils have a surface layer of very gravelly sandy loam. They make up about 10 percent of the unit. Bronell soils have a surface layer of very gravelly loam. They make up about 5 percent of the unit. Also included are small areas of talus in landscape positions below the Rock outcrop.

The Ustic Torriorthents are mainly very shallow but are shallow or moderately deep in some areas. These soils are well drained to somewhat excessively drained. They formed in residuum and colluvium derived from gneiss and granitic rock. Slopes range from 35 to 80 percent. About 0.01 to 0.1 percent of the surface is covered with boulders. The characteristics of the soils are variable, but the surface layer is commonly brown very bouldery sandy loam about 4 inches thick. The substratum is extremely gravelly sandy loam about 3 inches thick. Partially weathered granodiorite bedrock is at a depth of 7 inches. The soils are mildly alkaline. They are underlain by soft and hard bedrock. Except in areas on foot slopes, the soils are mostly noncalcareous.

Permeability is moderately rapid in the Ustic Torriorthents. Available water capacity is very low. Effective rooting depth is 4 to 30 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Rock outcrop consists of gneiss and granite bedrock. It occurs mostly as short vertical cliffs, bouldery projections, and exposed surfaces. It is on side slopes throughout the unit. Slopes range from 50 to 90 percent.

This unit is used as noncommercial woodland or for wildlife habitat. Most areas are inaccessible by livestock because of the slope, the Rock outcrop, and the boulders on the surface.

The potential plant community is mainly sparse pinyon and juniper and an understory of Scribner needlegrass, blue grama, Indian ricegrass, and mountainmahogany. If the condition of the understory deteriorates, blue grama, walkingstick cholla, yucca, and pricklypear increase. The potential production of native understory vegetation in normal years is about 350 pounds of air-dry vegetation per acre. The density of pinyon and juniper stands is variable.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this unit. The supply of these products is very limited, however, and access is severely limited by the slope and the bouldery, rough surface.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. Ustic Torriorthents are in the Pinyon-Juniper woodland site.

121—Ustic Torriorthents-Sedillo complex, 15 to 40 percent slopes. These soils are on fan terrace edges and hills. The steep terrace edges are formed by deep dissection of the fan terraces by streams. The unit also is on landslide deposits in an area between Canon City and Garden Park and is near Table Mountain in the northeastern part of the survey area. Slopes range from about 40 to 60 percent in a few landslide areas. The native vegetation is mainly pinyon and juniper. Elevation is 5,800 to 6,700 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 130 to 160 days.

This unit is about 70 percent Ustic Torriorthents and 20 percent Sedillo soil. The Ustic Torriorthents are on the middle and lower side slopes, and the Sedillo soil is on crests and the upper side slopes of terrace edges. Soils that are similar to the Sedillo soil but are mainly sand, gravel, and cobbles are on the crests. At the higher elevations are soils that are similar to the Ustic Torriorthents but have a clayey subsoil and a somewhat thicker dark surface layer.

Included with these soils in mapping are areas of Wiley soils on fan terraces and foot slopes. Wiley soils are not gravelly. They make up about 5 percent of the unit. Areas of the deep Shanta soils are in drainageways. Shanta soils have a thick, dark surface layer and a low content of gravel. They make up about 5 percent of the unit. Also included are areas of soils that have a high content of gypsum. These areas are on the lower ridges, within one-half mile of State Highway 115, in sec. 26, T. 17 S., R. 68 W.

The Ustic Torriorthents are shallow to deep and are well drained. They formed in residuum and colluvium derived dominantly from thinly bedded sandstone, siltstone, and shale. Slopes range from 15 to 40 percent. The soils are covered by a thin mantle of cobbly alluvium and colluvium. The texture of the underlying material is variable, but it ranges from very fine sandy loam to silty clay.

The characteristics of the Ustic Torriorthents are variable, but in the deeper areas the surface layer is typically dark grayish brown very gravelly loam about 2 inches thick. The upper 25 inches of the substratum is gravelly clay loam. The lower part to a depth of 42 inches is gravelly loam. Weathered sandstone is at a depth of about 42 inches. The soils are neutral to a depth of 2 inches. They are mildly alkaline to a depth of 10 inches and are moderately alkaline below that depth. At elevations above about 6,500 feet, the subsoil commonly has additional clay leached downward from the surface layer.

Permeability is moderate or slow in the Ustic Torriorthents. Available water capacity is low or very low. Effective rooting depth is 15 to 60 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

The Sedillo soil is deep and well drained. It formed in gravelly and cobbly alluvium derived dominantly from granite. In areas of landslide deposits, the soil formed in material weathered from sandstone and shale. The surface layer is typically dark brown extremely cobbly loam about 4 inches thick. In many areas that have landslide deposits, the surface is bouldery. The upper part of the subsoil is extremely cobbly sandy clay loam about 6 inches thick. The next 25 inches of the subsoil is mainly extremely stony loam. The lower part of the subsoil and the substratum to a depth of 60 inches or more are loam. A high content of accumulated calcium carbonate is at a depth of about 16 inches. The soil is neutral to a depth of 10 inches. It is moderately alkaline to a depth of 42 inches and is mildly alkaline below that depth.

Permeability is moderate in the Sedillo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used mainly for livestock grazing. It also is used as noncommercial woodland.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, sideoats grama, Scribner needlegrass, and true mountainmahogany. The potential production of native understory vegetation in normal years is about 400 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, bottlebrush squirreltail, pricklypear, and red threeawn increase.

Woodland products, such as firewood, Christmas trees, and pinyon nuts, are produced in areas of this unit. In the steeper areas, however, access to these products is limited. Harvesting some mature trees and thinning dense stands of the younger trees for use as poles increase the growth rate of the stand and increase the understory vegetation.

This unit is poorly suited to homesite development. The main limitation is the slope.

The capability classification is VIIe, nonirrigated. The unit is in the Pinyon-Juniper woodland site.

122—Wages loam, 2 to 9 percent slopes. This deep, well drained soil is on foot slopes and fan terraces. It formed in mixed alluvium and eolian material. The native vegetation is mainly grasses. Elevation is 6,000 to 6,800 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 120 to 150 days.

The surface layer is typically brown loam about 5 inches thick. The subsoil is clay loam about 16 inches thick. The substratum to a depth of 60 inches or more is sandy clay loam. The soil is mildly alkaline to a depth of 21 inches and is moderately alkaline below that depth. In some areas adjacent to the Wet Mountains, the depth to calcareous and moderately alkaline material is more than 40 inches

Included with this soil in mapping are areas of Sedillo soils on low ridges and near fan terrace edges. These soils are gravelly. They make up about 5 percent of the unit. Also included are areas of Shanta soils in swales. These soils make up about 5 percent of the unit. They have a thicker dark surface layer than the Wages soil.

Permeability is moderate in the Wages soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight to high. Several delineations have gullies that are 3 feet deep or more and as much as a mile in length. Occasional stringers and nests of stones are along these gullies.

This soil is used as rangeland.

The potential plant community is mainly blue grama, western wheatgrass, and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, broom snakeweed, walkingstick cholla, and other undesirable forbs and shrubs increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

123—Wahatoya-Tolex complex, 25 to 55 percent slopes. These soils are on mountainsides. The native vegetation is mainly Gambel oak and scattered ponderosa pine. Elevation is 7,600 to 8,800 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 110 days.

This unit is about 50 percent Wahatoya soil and 30 percent Tolex soil. The Wahatoya soil is on the lower and middle parts of side slopes, and the Tolex soil is on the middle and upper parts of side slopes, mainly in convex areas.

Included with these soils in mapping are areas of the deep Granile and Martinsdale soils on foot slopes and along drainageways. Granile soils make up about 10 percent of the unit. Martinsdale soils make up about 5 percent of the unit. They have a surface layer of sandy loam. Also included are areas of sandstone rock outcrop on ridges and in the steeper areas. These areas make up about 5 percent of the unit.

The Wahatoya soil is moderately deep and is well drained. It formed in residuum and colluvium derived dominantly from sandstone and some gneissic metasedimentary bedrock. Slopes range from 25 to 50 percent. The surface layer is typically grayish brown very gravelly sandy loam about 2 inches thick. The subsurface layer is pale brown very gravelly sandy loam about 8 inches thick. The subsoil is extremely gravelly sandy clay loam about 10 inches thick over 18 inches of extremely gravelly sandy loam. Hard, fractured sandstone is at a depth of about 38 inches. The soil is neutral to a depth of 20 inches and is moderately acid below that depth. In some areas the surface layer is very cobbly sandy loam.

Permeability is moderate in the Wahatoya soil. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

The Tolex soil is shallow and well drained. It formed mainly in residuum derived dominantly from sandstone and siltstone. In a few areas it formed in residuum and colluvium derived from gneissic metasedimentary rock. Slopes range from 25 to 55 percent. The surface is typically covered with a mat of undecomposed Gambel oak litter about 1 inch thick over highly decomposed litter about 1 inch thick. The subsurface layer is pale brown very channery sandy loam about 5 inches thick. The subsoil is mainly extremely channery sandy clay loam about 14 inches thick. Fractured sandstone is at a depth of about 19 inches. The soil is neutral. In some areas the surface layer is very cobbly sandy loam.

Permeability is moderate in the Tolex soil. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This unit is used mainly as noncommercial woodland or for wildlife habitat. It also is used for limited livestock grazing in the summer.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, sedges, muttongrass, and Gambel oak. The average annual production of air-dry vegetation is about 400 pounds per acre.

This unit is poorly suited to homesite development. The main limitations in the steeper areas and on ridges are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The unit is in the Ponderosa Pine woodland site.

124—Wann-Shanta, dry, association. These soils are on low stream terraces. The native vegetation is mainly grasses. Slopes are 0 to 1 percent. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 11 or 12 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 140 to 170 days.

This unit is about 55 percent Wann soil and 35 percent Shanta soil. The Wann soil is on low terraces near the stream channels. The Shanta soil is well drained or moderately well drained because it is farther from the stream channels.

Included with these soils in mapping are areas of Bloom soils in depressions adjacent to the uplands. Bloom soils have a surface layer of loam. They are very poorly drained. They make up about 5 percent of the unit. Also included are areas of Aquic Ustifluvents adjacent to stream channels and along former stream channels. These soils make up about 5 percent of the unit. They do not have a dark surface layer. In some areas they consist of a thin layer of loamy material over pebbles, cobbles, or coarse sand. They are silty clay loam, silt loam, loam, fine sandy loam, or sandy loam in the upper part.

The Wann soil is deep and somewhat poorly drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam about 12 inches thick. The upper 36 inches of the substratum is stratified sandy loam, fine sandy loam, and silt loam. The lower part to a depth of 60 inches or more is extremely gravelly sandy loam. The soil is mildly alkaline to a depth of 27 inches. It is moderately alkaline to a depth of 48 inches and is mildly alkaline below that depth. In some areas the surface layer is loam.

Permeability is moderately rapid in the Wann soil. Available water capacity is moderate. Effective rooting depth is limited by a seasonal high water table at a depth of 1 to 3 feet from April through June. In many areas the water table is within a depth of 4 feet throughout the year. The soil is slightly saline in a few small areas. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to occasional, brief periods of flooding in late spring and early summer, except in areas where it is protected by levees. Flooding is rare in some areas that are more than about 800 feet from the stream channel.

The Shanta soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam about 27 inches thick. The substratum to a depth of 60 inches or more is stratified sandy clay loam, loam, and silty clay loam. The soil is mildly alkaline to a depth of 48 inches and is moderately alkaline below that depth.

Permeability is moderate in the Shanta soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to rare, very brief periods of flooding in late spring and early summer, except in areas where it is protected by levees.

Most areas of this unit are used for irrigated pasture or cropland. A few areas are used as rangeland or for orchards. Hay and pasture are the main irrigated crops. Other crops include corn for silage and small grain.

The potential plant community on the Wann soil is mainly alkali sacaton, western wheatgrass, switchgrass, and blue grama. The average annual production of air-dry vegetation is about 2,500 pounds per acre.

The potential plant community on the Shanta soil is mainly blue grama, western wheatgrass, little bluestem, and Indian ricegrass. The average annual production of air-dry vegetation is about 1,400 pounds per acre.

If this unit is used for irrigated crops, the main limitation is depth to the water table during the irrigation season. A high level of production can be obtained by using varieties adapted to moderate wetness and by installing a modified irrigation system that can subirrigate crops without raising the water table. A drainage system may also be needed in a few areas. These soils are subject to brief periods of flooding in areas where they are not protected, particularly in areas within about 800 feet of the Arkansas River channel. Irrigation water can be applied by corrugation, furrow, sprinklers, border flooding, or flooding from contour ditches.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage. If properly managed, these soils can produce 6 tons of irrigated alfalfa hay per acre.

This unit is poorly suited to homesite development. The main limitations are the flooding and the seasonal high water table.

The capability classification of the Wann soil is IIw, irrigated, and IVw, nonirrigated. The capability classification of the Shanta soil is IIe, irrigated, and VIe, nonirrigated. The unit is about 65 percent in the Salt Meadow #30 range site and 35 percent in the Overflow #36 range site.

125—Wesix very channery loam, 5 to 40 percent slopes. This shallow, well drained soil is on pediments, cuestas, and mountainsides. It formed in residuum derived from limestone. The native vegetation is mainly pinyon and juniper. Elevation is 6,000 to 6,800 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 115 to 135 days.

Typically, the surface layer is brown very channery loam about 8 inches thick. The substratum is very channery loam about 5 inches thick. Limestone bedrock is at a depth of about 13 inches. The soil is moderately alkaline.

Included with this soil in mapping are areas of rock outcrop. These areas make up about 10 percent of the unit. Rock outcrop occurs as the exposed surface of the tilted limestone strata underlying the surrounding Wesix soil. Also included are some areas of soils that have a stony or flaggy surface layer.

Permeability is moderate in the Wesix soil. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium to very rapid, and the hazard of water erosion is slight to very high.

This soil is used as noncommercial woodland, for wildlife habitat, or for livestock grazing.

The potential plant community is mainly pinyon and juniper and an understory of sideoats grama, blue grama, Scribner needlegrass, and Indian ricegrass. The potential production of native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre. If the condition of the understory deteriorates, blue grama, red threeawn, yucca, broom snakeweed, and other forbs and shrubs increase.

Woodland products, such as firewood, fence posts, Christmas trees, and pinyon nuts, are produced in areas of this soil. The average site index of pinyon and juniper is about 55. The use of tree spades for removal of transplants is severely limited by the high content of rock fragments in the soil and the depth to bedrock.

Thinning the overstory generally enhances reproduction and promotes the growth of grass and younger trees. After pinyon and juniper are thinned or harvested, seeding grasses reduces the hazard of erosion and increases grass production. Deferring grazing in harvested areas for at least 2 years ensures the development of a plant cover that is sufficient to protect the soil from erosion.

This soil is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The soil is in the Pinyon-Juniper woodland site.

126—Wetmore-Bundo, dry-Rock outcrop complex, 35 to 75 percent slopes. This map unit is on steep canyonsides. The native vegetation is mainly ponderosa pine and Gambel oak on south-facing side slopes and Douglas-fir on north-facing side slopes. Elevation is 7,000 to 8,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 75 to 110 days.

This unit is about 40 percent Wetmore soil, 30 percent Bundo, dry, soil, and 20 percent Rock outcrop. The Wetmore soil is mainly on south-facing side slopes. The Bundo soil is on north-facing side slopes. The Rock outcrop is on ridges, the upper side slopes, and canyon rims.

Included in mapping are areas of the moderately deep Lakehelen soils just below ridges and canyon rims. These soils have a surface layer of very stony fine sandy loam. They make up about 5 percent of the unit. Also included are areas of the deep Tecolote soils on south-facing foot slopes. These soils have a clayey subsoil at a shallower depth than the Bundo soil. They make up about 5 percent of the unit.

The Wetmore soil is shallow and well drained. It formed in residuum derived dominantly from gneiss and granite. Slopes range from 35 to 65 percent. Typically, the surface is covered with a mat of ponderosa pine and Gambel oak litter about 1 inch thick. The subsurface layer is very pale brown very gravelly sandy loam about 3 inches thick. The subsoil is very gravelly sandy loam about 7 inches thick. Hard, fractured gneiss is at a depth of about 10 inches. The soil is slightly acid. In some areas the surface layer is very cobbly sandy loam.

Permeability is rapid in the Wetmore soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

The Bundo soil is deep and well drained. It formed in colluvium derived dominantly from granite. Slopes range from 35 to 65 percent. Typically, the surface is covered with a mat of fir litter about 1 inch thick. The surface layer is light brownish gray or light gray very gravelly sandy loam about 8 inches thick. Below this is light gray extremely gravelly sandy loam about 18 inches thick. The subsoil is extremely gravelly sandy clay loam. It is about 19 inches thick. The substratum to a depth of 60 inches or more is extremely gravelly sandy loam. The soil is neutral to a depth of 45 inches and is slightly acid below that depth. In some areas the surface layer is very cobbly sandy loam.

Permeability is moderate in the Bundo soil. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of gneiss or granite. It occurs as short cliffs and crags about 20 to 75 feet in height. Slopes range from 35 to 75 percent.

This unit is used for watershed, wildlife habitat, or recreation. It is mainly located along the scenic Phantom Canyon. Most areas are inaccessible by livestock because of the slope. Areas on the lower slopes are used for recreation.

The potential plant community on the Wetmore soil is mainly ponderosa pine and an understory of mountainmahogany, Gambel oak, Arizona fescue, and mountain muhly. The potential production of native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre.

The potential plant community on the Bundo soil is mainly Douglas-fir and some white fir and an understory of kinnikinnick, Kentucky bluegrass, and Arizona fescue. The potential production of native understory vegetation in normal years is about 50 pounds of air-dry vegetation per acre.

This unit is suited to production of ponderosa pine or Douglas-fir. The site index for ponderosa pine on the Wetmore soil is about 35, and the site index for Douglas-fir on the Bundo soil is about 60. In most areas the use of equipment is impractical because of the slope.

This unit is suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIe, nonirrigated. The Wetmore soil is about 60 percent in the Ponderosa Pine woodland site, and the Bundo soil is 40 percent in the Douglas-Fir woodland site.

127—Wetmore-Rock outcrop complex, 40 to 80 percent slopes. This map unit is on very steep mountainsides and canyonsides. The native vegetation is mainly ponderosa pine and Gambel oak. Elevation is 7,000 to 8,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 75 to 110 days.

This unit is about 50 percent Wetmore soil and 35 percent Rock outcrop. The components are intermingled in all areas of the unit.

Included in mapping are areas of the moderately deep Lakehelen soils in narrow drainageways and the deep Tecolote soils on foot slopes. Lakehelen soils have a surface layer of very stony fine sandy loam. They make up about 10 percent of the unit. Tecolote soils have a surface layer of very gravelly sandy loam. They make up about 5 percent of the unit.

The Wetmore soil is shallow and well drained. It formed in residuum derived dominantly from gneiss and granite. Slopes range from 40 to 70 percent. The surface is typically covered with a mat of ponderosa pine and Gambel oak litter about 1 inch thick. The subsurface layer is very pale brown very gravelly sandy loam about 3 inches thick. The subsoil is very gravelly sandy loam about 7 inches thick. Hard, fractured gneiss is at a depth of about 10 inches. The soil is slightly acid. In some areas the surface layer is very cobbly sandy loam.

Permeability is rapid in the Wetmore soil. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid or very rapid, and the hazard of water erosion is very high.

The Rock outcrop consists of gneiss or granodiorite. It occurs as short cliffs and crags about 10 to 75 feet high. Slopes range from 50 to 80 percent.

This unit is used for wildlife habitat, watershed, or recreation. Most areas are inaccessible by livestock because of the slope.

The potential plant community on the Wetmore soil is mainly ponderosa pine and an understory of mountainmahogany, Gambel oak, Arizona fescue, and mountain muhly. The potential production of native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. The soil is suited to production of ponderosa pine. The site index for ponderosa pine is about 35. Many areas are dominated by Gambel oak and an overstory of scattered pine.

This unit is poorly suited to homesite development. The main limitations are the slope and the depth to bedrock.

The capability classification is VIIs, nonirrigated. The Wetmore soil is in the Ponderosa Pine woodland site.

128—Wiley loam, cool, 2 to 6 percent slopes. This deep, well drained soil is on fan terraces and foot slopes. It formed in alluvium and eolian fine sands and silt. The native vegetation is mainly grasses. Elevation is 5,800 to 6,200 feet. The average annual precipitation is 13 to 16 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 125 to 155 days.

Typically, the surface layer is brown loam about 4 inches thick. The upper part of the subsoil is silty clay loam about 17 inches thick. The next part, to a depth of 40 inches, is silt loam. The lower part to a depth of 60 inches or more is loam. The soil is mildly alkaline to a depth of 4 inches and is moderately alkaline below that depth.

Included with this soil in mapping are areas of Nunn soils in depressions. These soils make up about 10 percent of the unit. They have more clay in the subsoil than the Wiley soil.

Permeability is moderate in the Wiley soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid or very rapid, and the hazard of water erosion is high or very high.

This soil is used as rangeland. A few small areas were formerly cultivated but have been reseeded to grass. Other small areas are occasionally cropped.

The potential plant community is mainly western wheatgrass, blue grama, and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, ring muhly, broom snakeweed, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is IVe, nonirrigated. The soil is in the Loamy Foothill #202 range site.

129—Wiley silt loam, 1 to 6 percent slopes. This deep, well drained soil is on fan terraces and foot slopes. It formed in alluvium and eolian fine sands and silt. The native vegetation is mainly grasses. Elevation is 5,200 to 5,500 feet. The average annual precipitation is 12 or 13 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is mainly silty clay loam about 22 inches thick. The upper 12 inches of the substratum is silt loam. The lower part to a depth of 60 inches is loam. The soil is neutral to a depth of 5 inches and is moderately alkaline below that depth. In some areas on ridges, the soil does not have a developed subsoil.

Included with this soil in mapping are areas of Nunn soils in swales. These soils are clayey. They make up about 5 percent of the unit.

Permeability is moderate in the Wiley soil. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to very rapid, and the hazard of water erosion is slight to very high.

This soil is used as rangeland.

The potential plant community is mainly blue grama and western wheatgrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, red threeawn, ring muhly, pricklypear, and broom snakeweed increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Plains #6 range site.

130—Youga sandy loam, 3 to 10 percent slopes. This deep, well drained soil is on foot slopes and fans. It formed in alluvium and colluvium. The native vegetation is mainly grasses. Elevation is 8,200 to 9,000 feet. The average annual precipitation is 17 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 50 to 85 days.

Typically, the surface layer is dark brown sandy loam about 12 inches thick. The subsoil is gravelly sandy clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is very gravelly sandy loam. The soil is slightly acid to a depth of 12 inches. It is neutral to a depth of 33 inches and is mildly alkaline below that depth.

Included with this soil in mapping are areas of Ess soils on short, steep slopes along drainageways. These soils make up about 5 percent of the unit. They are more gravelly than the Youga soil. Also included are areas of Adderton soils in drainageways. These soils have a thicker dark surface layer than the Youga soil. They make up about 5 percent of the unit.

Permeability is moderately slow in the Youga soil. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This soil is used as rangeland.

The potential plant community is mainly mountain muhly, Arizona fescue, Parry oatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, blue grama, bottlebrush squirreltail, broom snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This soil is well suited to homesite development.

The capability classification is VIe, nonirrigated. The soil is in the Loamy Park #222 range site.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 38,160 acres in the survey area, or about 4 percent of the total acreage, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation were available.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed at the end of this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that receive an inadequate amount of rainfall qualify as prime farmland only in areas where this limitation has been overcome by irrigation. Irrigation is needed on all of the map units listed at the end of this section. Onsite evaluation is needed to determine whether or not a specific area is irrigated.

34	Fort Collins loam, 1 to 4 percent slopes (where irrigated)
35	Fort Collins loam, cool, 0 to 2 percent slopes (where irrigated)
36	Fort Collins loam, cool, 2 to 5 percent slopes (where irrigated)
46	Jodero sandy loam, 2 to 5 percent slopes (where irrigated)
48	Kim loam, 0 to 3 percent slopes (where irrigated)
51	Kim loam, moderately wet, 0 to 3 percent slopes (where irrigated)
65	Manvel silt loam, 0 to 3 percent slopes (where irrigated)
70	Martinsdale Variant sandy loam, 2 to 5 percent slopes (where irrigated)
104	Shanta loam, 0 to 3 percent slopes (where irrigated)
105	Shanta loam, dry, 0 to 3 percent slopes (where irrigated)
124	Wann-Shanta, dry, association (where irrigated)
128	Wiley loam, cool, 2 to 6 percent slopes (where irrigated)
129	Wiley silt loam, 1 to 6 percent slopes (where irrigated)

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or rock fragments can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils in the survey area are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

About 1.5 percent of the survey area, or about 13,000 acres, is used for crops or as permanent pasture. About 7,500 acres is periodically planted to alfalfa, grass mixtures, or alfalfa-grass mixtures as part of a cropping rotation system. About 3,000 acres is permanent pasture. Rotations commonly include small grain and, in some areas, corn. The corn is mainly harvested for silage (fig. 5). About 1,000 acres is planted each year to nonirrigated or partially irrigated wheat.

About 80 acres of irrigated land is used for vegetable and fruit production. Apples and cherries are the most important fruits grown in the survey area. The production of wine grapes is a small but growing industry.

The irrigated cropland and pasture are mainly in the Upper Arkansas River Valley and the valleys of the river's major tributaries. In the high mountain valleys, the growth of crops is generally limited by the short, cool growing season. Wetness limits the growth of introduced and native grasses. Surface water is the dominant source of irrigation water and is distributed according to established surface water rights for each stream.

Because all known water sources of sufficient quality and quantity have been developed, the potential for increasing the amount of irrigation water available is not significant. The acreage of irrigated soils is gradually decreasing as land is taken out of production for commercial, industrial, and recreational uses.

The main management concern is the proper utilization of irrigation water. The best method of

Figure 5.—Corn is commonly grown for silage on productive soils near the Arkansas River between Canon City and Florence.

irrigation depends on the slope, the texture of the surface layer, and the type of crop to be grown. If sufficient water is available, enough water should be applied to refill the root zone with enough excess to leach salts below the root zone. Excessive irrigation prevents adequate aeration of the soils. Insufficient irrigation prevents adequate rooting in the lower part of the root zone, results in erosion in sloping areas, and may cause a buildup of the water table.

A crop rotation system should include a crop, such as alfalfa, that improves tilth, increases the content of organic matter and nitrogen, and fully utilizes the fertilizer and water that were applied and stored when the previous crop was grown. If sufficient water is available, alfalfa should be seeded in August or September. Seeding during this time of the year reduces the growth of weeds. Oats are commonly planted as a nurse crop. The most successful plantings for hay or pasture are made in a well prepared, firmly packed soil. Good, clean stubble also makes a good seedbed.

All irrigated crops respond to applications of fertilizer. A fertilizer containing phosphorus should be applied to alfalfa, and other crops benefit from additions of nitrogen and phosphorus. Fertilizer also is needed for highly productive pastures and mountain meadows. The amount applied should be reduced, however, in areas that have inadequate amounts of water.

Nitrogen can be applied to grass after the seedlings have emerged. It should be applied annually to maintain plant vigor and composition throughout the life of the plant. If an old stand of pasture or hay has been plowed up, growing oats or barley for 1 or 2 years helps to control undesirable grasses and weeds. The oats and barley are also marketable. Smoothing the surface of the soil helps to control the distribution of irrigation water.

Adapted grasses suitable for planting in the eastern part of Fremont County include smooth bromegrass, intermediate wheatgrass, orchardgrass, and tall fescue. Mixtures of smooth brome, intermediate wheatgrass, and tall fescue have commonly been used in this area. More information about suitable plant mixtures is available at the local office of the Natural Resources Conservation Service. Grasses that are suitable for planting in the high mountain meadows include smooth bromegrass, timothy, meadow foxtail, and Garrison creeping foxtail. Drilling grass seed with a grass or grain drill at a depth of about ½ inch produces a better stand than broadcast seeding.

The proper use and management of grasses and grass-legume pastures increase production. The height of the stubble or leaf generally determines when a pasture should or should not be grazed. Generally, pasture plants should be at least 8 inches tall when grazing is started. Maintaining a minimum height of 4 inches keeps the plants healthy and vigorous, reduces thinning and winterkill, minimizes erosion, and aids in the even distribution of irrigation water. Such management practices as dragging, smoothing, renovation, and overseeding can be used to maintain a smooth pasture that has a good composition of plants.

Loss of soil because of wind erosion or water erosion results in decreased productivity. The fertility, tilth, and available water capacity of the soil decrease as the topsoil is removed and the subsoil becomes part of the plow layer. The remaining soil generally is susceptible to further erosion, and soil blowing can damage surrounding areas and pose a health hazard. Sloping areas should be farmed across the slope or along the contour where practical, especially on clayey or silty soils, such as Nunn or Manvel soils.

Areas near Penrose and Wetmore are subject to soil blowing. Therefore, periods when the soil is left bare should be kept to a minimum. Leaving sufficient amounts of crop residue on the surface helps to protect the soil. Ridging the soil is less effective than crop residue management, but it can help to control soil blowing when the soil is uncovered during a windy period. In areas of Nunn soils north of Wetmore, a tillage pan can form at the bottom of the plow layer. This pan restricts water penetration and root growth. Plowing the soil at varying depths helps to prevent the formation of a tillage pan.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management and with adequate irrigation are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification for irrigated soils also is shown in the table.

The yields are based mainly on the experience and records of farmers and conservationists. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(8)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland

Kenneth D. Lair, range conservationist, Natural Resources Conservation Service, helped prepare this section.

About 40 percent of Fremont County is rangeland. The rangeland is mainly used by the cattle industry for cow-calf and yearling operations. Hay is used to supplement range forage production in the winter and spring. At high elevations, the rangeland is generally not utilized for grazing during the winter.

Soils and climate strongly influence the kind and amount of natural vegetation. Soils in valley bottoms and on stream terraces are often wet and have a high content of organic matter. They support a lush community of water-tolerant grasses, sedges, and rushes.

Soils on the plains receive a relatively low amount of precipitation, are calcareous in the upper layers, and have a low content of organic matter. Grasses such as blue grama, western wheatgrass, and needleandthread are dominant in these areas.

Soils in the foothills are cooler and receive more precipitation than soils on the plains. Also, they have a higher content of organic matter content. Carbonates are generally leached from the surface layer. Blue grama, western wheatgrass, needleandthread, Scribner needlegrass, sideoats grama, and little bluestem are common. The average annual production of vegetation on the deep soils in the valleys of the foothills is generally higher than on the plains. However, production is very low in areas of shallow soils on steep slopes of the foothills.

In the mountains, the soils are influenced by a climate that is even cooler and more moist than that in the foothills. Carbonates are leached to a greater depth in these soils than in the soils in the foothills, and they have a higher content of organic matter. Arizona fescue, mountain muhly, and needleandthread are the most common grasses. The average annual production of vegetation is commonly about 800 pounds more per acre than on the plains.

Proper management of grazing on rangeland helps to maintain or reestablish the proper kind, amount, and vigor of the plants that make up the plant community. A planned grazing system is an important management measure (fig. 6). Deferred grazing, for example, is the postponement of grazing until the seed of the key forage plants is mature or nearly mature. Deferment

Figure 6.—An area where grazing has been well planned contrasted with an area that has been overgrazed.

should be rotated among pastures for a more uniform use of all forage plants, which allows the plants to increase in vigor and to develop seed prior to being grazed. The proper location of watering areas, fencing, and salt blocks helps to keep livestock uniformly distributed.

Furrowing, chiseling, and pitting are mechanical practices that help to control runoff and erosion, improve the rate of water intake, and speed the recovery of vegetation. These practices are most effective in areas of sod-bound range in poor or fair condition on the plains and foothills. In areas of gullied land, dams and diversions are needed to control erosion.

Range seeding may be needed to improve severely deteriorated rangeland. Range seeding generally involves the interseeding of depleted range, but it may be applied to prepared seedbeds. The best time for seeding depends on elevation, moisture content, temperature, and the species of grasses to be planted.

On the plains, warm-season grasses generally should be seeded between April 15 and June 1. In the fall, seeding of warm-season and cool-season grasses should take place after the first frost to ensure that the plants will not germinate before spring. Fall seedings are generally more successful than spring seedings. In the foothills and mountains, cool-season grasses should be seeded between June 15 and July 15.

Using herbicides or mechanical methods to control brush improves deteriorating areas of range that have a thick cover of undesirable woody shrubs competing with desirable grasses, forbs, and shrubs.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil, the range or woodland site; the total annual production of range or woodland understory vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Explanation of the column headings in table 6 that apply to rangeland follows. Explanation of the column headings that apply to woodland is given in the section "Woodland Understory Vegetation."

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The number following the range site name is a unique identifier that separates each of the range sites used in Colorado. Each of the range sites is described in detail in section II of the "Field Office Technical Guide," which is available at local offices of the Natural Resources Conservation Service.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common plant name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some woodland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 6 shows, for each soil suitable for woodland, the woodland site and the potential for producing understory vegetation. The *total production* of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4½ feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 6 also lists the common names of the *characteristic vegetation* on each soil and the *composition*, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

Woodland Management and Productivity

Woodland makes up about 60 percent of the survey area. The woodland sites in the survey area include pinyon-juniper, ponderosa pine, Douglas-fir, aspen, and spruce-fir.

The pinyon-juniper woodland site makes up about 45 percent of the survey area. It is in the foothills and mountains at an elevation of 6,000 to 9,000 feet. This woodland site is generally used for wood products, such as firewood, fence posts, and Christmas trees. Chaining promotes the growth of forage plants. It is most suited to gently sloping areas. Pinyon and juniper are mainly in areas of Boyle, Coaldale, Cathedral, Teaspoon, Swissvale, Rizozo, Wesix, Redcameron, and Travessilla soils and Ustic Torriorthents.

The ponderosa pine woodland site makes up about 6 percent of the survey area. It is in the foothills and mountains at an elevation of 6,300 to 9,600 feet. Stands of ponderosa pine are used for wood products, such as sawtimber, mine props, railroad ties, and fence posts. The main management concern is protecting the soils from fire, insects, and diseases. In many stands, thinning is needed to remove the older trees that are susceptible to mountain pine beetle and dwarf mistletoe. Soils that support ponderosa pine are Larkson, Larand, Raleigh, Tolex, Tecolote, Seitz, Wahatoya, Wetmore, and Whiteman soils.

Rogert soils support an open stand of ponderosa pine and a relatively thick understory of grasses. These soils are in areas of mixed rangeland and woodland. They make up about 5 percent of the survey area.

The Douglas-fir woodland site makes up about 4 percent of the survey area. This site commonly includes some areas that also support white fir and ponderosa pine. It is on mountainsides at an elevation of 7,500 to 11,500 feet. Douglas-fir is the most valuable tree in the survey area, but most stands are of poor quality. Sawtimber may be harvested, but production of Christmas trees is a better alternative. Douglas-fir is mainly in areas of Granile, Herakle, Lakehelen, Seitz, and Guffey soils.

The aspen woodland site makes up about 0.5 percent of the survey area. It is in the mountains at an elevation of 9,000 to 11,000 feet. It is in areas of Cryoborolls. Aspen stands are used mainly for seasonal grazing and wildlife habitat. Aspen is commonly an included species in other woodland sites.

The spruce-fir woodland site makes up about 2 percent of the survey area. Engelmann spruce and some subalpine fir are on mountainsides at an elevation of 9,500 to 11,600 feet. Other species included in this site are lodgepole pine, bristlecone pine, aspen, and Douglas-fir. Sawtimber and other wood products are harvested. Bundo and Larand soils support the species in this woodland site.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol,* a number, indicates the potential productivity of the soils for important trees. The number 1 indicates low potential productivity; 2, moderate; 3, moderately high; 4, high; and 5, very high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X,* stoniness or rockiness; *W,* excessive water in or on the soil; *T,* toxic substances in the soil; *D,* restricted rooting depth; *C,* clay in the upper part of the soil; *S,* sandy texture; *F,* high content of coarse fragments in the soil profile; and *N,* snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of the *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Limited moisture is the main limitation affecting windbreaks and environmental plantings on the plains and in the foothills. The establishment of windbreaks is difficult in the mountains because of the cool, short growing season, rockiness, limited moisture, and areas of soils that have a high water table. The selection of adapted species, careful site selection and preparation, timely cultivation, and additions of supplemental water in the early stages of plant growth can help to make windbreak plantings successful.

Additional information on planning windbreaks and screens and the care of trees can be obtained from local offices of the Natural Resources Conservation Service or the Colorado State Forest Service or from a local nursery.

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are Arizona fescue, hairy goldaster, narrowleaf penstemon, western wheatgrass, and blue grama.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness.

Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, Gambel oak, and snowberry.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are cinquefoil, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include elk, deer, wild turkey, ruffed grouse, woodpeckers, squirrels, gray fox, raccoon, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, grouse, meadowlark, and coyote.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines (fig. 7). This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil

Figure 7.—A profile of a Cascajo soil. This soil is on remnants of old river terraces now high above the Arkansas River. Areas of Cascajo soils are an important source of sand and gravel.

and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Taxonomic Units and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Taxonomic Units and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For some soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable, *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding in any year is nearly 0 percent to 5 percent), *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding in any year is 5 to 50 percent), and *frequent* that it occurs often under normal weather conditions (the chance of flooding in any year is more than 50 percent). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of the year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(9)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Cryoborolls (*Cry*, meaning cold, plus *borolls*, the suborder of the Mollisols that has a frigid or cryic temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Cryoborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, shallow Typic Cryoborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series or higher taxonomic unit. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(10)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(9)*. Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the unit.

The map units of each taxonomic unit are described in the section "Detailed Soil Map Units."

Adderton Series

The Adderton series consists of deep, well drained soils on stream terraces and toe slopes. These soils formed in mixed alluvium. Slopes range from 2 to 6 percent. The average annual precipitation is 16 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are fine-loamy, mixed Cumulic Cryoborolls.

Typical pedon of Adderton loam, 2 to 6 percent slopes, in an unsectionalized area about 3,200 feet north and 1,850 feet west of the northeast corner of sec. 6, T. 49 N., R. 12 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 10 percent gravel and 2 percent cobbles; neutral; abrupt smooth boundary.

A2—3 to 12 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

A3—12 to 20 inches; dark grayish brown (10YR 4/2), stratified sandy loam and loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

A4—20 to 27 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 10 percent gravel and 2 percent cobbles; neutral; abrupt smooth boundary.

A5—27 to 34 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; about 10 percent gravel; mildly alkaline; abrupt smooth boundary.

A6—34 to 39 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak and moderate subangular blocky; hard, firm, very sticky and very plastic; mildly alkaline; abrupt smooth boundary.

C1—39 to 49 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; about 5 percent gravel; mildly alkaline; abrupt smooth boundary.

2C2—49 to 60 inches; brown (10YR 5/3) very gravelly loamy sand, dark brown (10YR 3/3) moist; single grain; loose, nonsticky and nonplastic; about 50 percent gravel; mildly alkaline.

The mollic epipedon is 20 to 60 inches thick. The content of rock fragments is 0 to 15 percent in the control section, but it ranges from 0 to 35 percent throughout the profile. It increases with increasing depth. The texture of the control section is mainly loam or clay loam. Thin strata of silty clay loam, sandy loam, gravelly sandy loam, gravelly sandy clay loam, or gravelly loam are in some pedons. Reaction is neutral or mildly alkaline.

Amalia Series

The Amalia series consists of deep, well drained soils on mountainsides and canyonsides. These soils formed mainly in colluvium derived from andesite and breccia. In an area north of Garden Park, they formed in limestone colluvium. Slopes range from 25 to 50 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Borollic Haplargids.

Typical pedon of Amalia very gravelly loam, 25 to 50 percent slopes, about 2,000 feet west and 2,000 feet south of the northeast corner of sec. 29, T. 49 N., R. 10 E.

Oi—1 inch to 0; pinyon litter.

A—0 to 4 inches; brown (7.5YR 5/2) very gravelly loam, dark brown (7.5YR 4/2) moist; weak medium granular structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel, 10 percent cobbles, and 1 percent stones; neutral; clear smooth boundary.

Bt1—4 to 9 inches; brown (7.5YR 5/3) very gravelly clay loam, brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common moderately thick clay films on faces of peds; about 45 percent gravel, 10 percent cobbles, and 2 percent stones; mildly alkaline; abrupt smooth boundary.

Bt2—9 to 13 inches; light brown (7.5YR 6/4) very gravelly clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 45 percent gravel, 10 percent cobbles, and 2 percent stones; neutral; abrupt smooth boundary.

Bk1—13 to 31 inches; white (10YR 8/2) very gravelly sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; about 35 percent gravel and 15 percent cobbles; about 20 percent calcium carbonate equivalent; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—31 to 60 inches; very pale brown (10YR 7/4) very gravelly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; about 25 percent gravel and 15 percent cobbles; visible pendants of calcium carbonate on pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—60 to 75 inches; very pale brown (10YR 7/4) gravelly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; about 25 percent gravel; visible filaments and pendants of calcium carbonate on pebbles; strongly effervescent; moderately alkaline.

Depth to the base of the Bt horizon is 12 to 30 inches. Secondary calcium carbonate is at a depth of 12 to 30 inches. Hue is 7.5YR or 10YR throughout the profile.

Reaction is neutral or mildly alkaline in the A and Bt horizons. The Bt horizon is very gravelly clay loam or very gravelly sandy clay loam. The Bk horizon is very gravelly sandy loam, very gravelly loam, or gravelly loam.

Aquic Ustifluvents

Aquic Ustifluvents are deep, moderately well drained and somewhat poorly drained soils on stream terraces and flood plains. These soils formed in stratified alluvium. Slopes are 0 to 1 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 51 to 53 degrees F.

Reference pedon of Aquic Ustifluvents, about 2,550 east and 1,850 feet south of the northwest corner of sec. 26, T. 19 S., R. 68 W.

A1—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline; abrupt smooth boundary.

A2—3 to 13 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; visible secondary calcium carbonate occurring as common fine soft masses; violently effervescent; moderately alkaline; clear smooth boundary.

Cg1—13 to 20 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; few fine distinct yellowish brown (10YR 5/6) mottles; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline; clear smooth boundary.

Cg2—20 to 40 inches; light brownish gray (10YR 6/2), stratified fine sandy loam, loam, and loamy fine sand, grayish brown (10YR 5/2) moist; many fine to coarse distinct yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline; abrupt smooth boundary.

2C—40 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; about 50 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline.

The depth to bedrock is 60 inches or more. The depth to layers that have mottles ranges from 3 to 30 inches. The content of rock fragments is 0 to 20 percent in the control section. Hue is 5YR to 2.5Y throughout the profile. A seasonal high water table is at a depth of 10 to 40 inches in early summer.

The A horizon is fine sandy loam, loam, or silty clay loam. The C horizon is fine sandy loam, loam, sandy clay loam, loamy fine sand, loamy sand, loamy coarse sand, coarse sand, silt loam, silty clay loam, or clay loam. Stratified layers of sand and well rounded gravel are at a depth of 3½ feet or more in most areas.

Aquolls

Aquolls are deep, poorly drained and very poorly drained soils on fans, fan terraces, and stream terraces. These soils formed in alluvium. Slopes range from 0 to 5 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 43 to 46 degrees F.

Reference pedon of Aquolls, 0 to 5 percent slopes, in an unsectionalized area about 50 feet north and 750 feet west of the intersection of Hayden Creek Road and U.S. Highway 50 at Coaldale, T. 48 N., R. 10 E.

Ag1—0 to 5 inches; gray (10YR 5/1) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles; strong medium granular structure; hard, very friable, nonsticky and nonplastic; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Ag2—5 to 23 inches; gray (10YR 5/1) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; hard, friable, slightly sticky and nonplastic; strongly effervescent; mildly alkaline; clear smooth boundary.

Cg—23 to 60 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and nonplastic; strongly effervescent; moderately alkaline.

The depth to a seasonal high water table is 0 to 24 inches. The mollic epipedon is 20 to more than 60 inches thick. The content of rock fragments is 0 to 35 percent in the control section. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The Ag horizon is sandy loam, fine sandy loam, or loam. The Cg horizon is loamy sand, sandy loam, loam, or fine sandy loam.

Arents

Arents are deep, well drained soils on manmade hills. These soils formed in redistributed coal-mining spoil and overburden. Slopes range from 10 to 45 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 50 to 52 degrees F.

Reference pedon of Arents, 10 to 45 percent slopes, about 2,600 feet south and 2,300 feet east of the northwest corner of sec. 7, T. 20 S., R. 69 W.

C1—0 to 11 inches; dark grayish brown, pale yellow, and black shaly loam; when mixed, grayish brown (2.5Y 5/2) dry and very dark grayish brown (2.5Y 3/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; about 5 percent gravel; about 25 percent shale fragments; dominantly strongly acid; clear smooth boundary.

C2—11 to 60 inches; dark grayish brown, gray, pale yellow, and black shaly sandy clay loam; when mixed, grayish brown (2.5Y 5/2) dry and dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; about 5 percent gravel; about 30 percent black shale fragments; strongly acid to neutral.

The content of hard rock fragments ranges from 0 to 80 percent by volume. The content of rock fragments in individual soil layers is generally either 20 percent or less or 35 percent or more. The content of soft sandstone and shale fragments ranging from thin chips to fragments ¾ inch thick is mainly 20 to 90 percent by volume. Reaction ranges from extremely acid to moderately alkaline.

The soils are mainly nonsaline or slightly saline. Some of the original mine spoils had a relatively high content of sulfur in the form of pyrite and other substances.

Bloom Series

The Bloom series consists of deep, poorly drained soils on stream terraces. These soils formed in alluvium. Slopes range from 0 to 2 percent. The average annual precipitation is 11 or 12 inches, and the average annual air temperature is 51 to 53 degrees F. The soils are fine-silty, mixed (calcareous), mesic Aeric Fluvaquents.

Typical pedon of Bloom loam, 0 to 2 percent slopes, about 50 feet south and 2,350 feet west of the northeast corner of sec. 22, T. 19 S., R. 69 W.

Ag—0 to 3 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct mottles; weak fine granular structure; slightly hard, very friable, sticky and slightly plastic; slightly effervescent; moderately alkaline; clear smooth boundary.

ACg—3 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct mottles; weak fine subangular blocky structure; hard, friable, sticky and plastic; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg1—14 to 26 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles; massive; hard, firm, sticky and plastic; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg2—26 to 49 inches; gray (5Y 6/1) silty clay loam, dark gray (2.5Y 4/1) moist; massive; hard, firm, sticky and plastic; slightly effervescent; moderately alkaline; clear smooth boundary.

2Cg3—49 to 60 inches; gray (5Y 6/1) extremely gravelly sand, dark gray (2.5Y 4/1) moist; single grain; loose, nonsticky and nonplastic; about 65 percent gravel; slightly effervescent; moderately alkaline.

The content of rock fragments is 0 to 10 percent in the control section. A seasonal high water table is at a depth of 6 to 24 inches. The A horizon is very slightly saline or slightly saline. The lower horizons are very slightly saline.

Boyle Series

The Boyle series consists of shallow, well drained soils on mountainsides, hills, and ridges. These soils formed in residuum derived from gneiss and granite. Slopes range from 5 to 55 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed, shallow Aridic Argiborolls.

Typical pedon of Boyle very gravelly sandy loam, 10 to 40 percent slopes, in an unsectionalized area about 4,600 feet north and 9,250 feet west of the intersection of Custer County Road 227 and the Fremont County line:

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very gravelly sandy loam, very dark brown

(10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; about 35 percent gravel, 20 percent cobbles, and 2 percent stones; neutral; abrupt smooth boundary.

Bt1—3 to 9 inches; dark brown (10YR 4/3) extremely gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, firm, sticky and slightly plastic; common thin clay films on faces of peds and lining pores; about 45 percent gravel and 20 percent cobbles; neutral; clear smooth boundary.

Bt2—9 to 17 inches; dark yellowish brown (10YR 4/4) extremely gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; common moderately thick clay films on faces of peds and lining pores; about 55 percent gravel and 15 percent cobbles; neutral; clear irregular boundary.

Cr—17 to 20 inches; decomposed gneiss.

Depth to the base of the Bt horizon is 9 to 20 inches. The mollic epipedon is 7 to 14 inches thick. The depth to paralithic contact is 10 to 20 inches. Reaction is slightly acid or neutral throughout the profile. The A and Bt horizons have hue of 10YR or 7.5YR. The content of rock fragments is 35 to 80 percent in the Bt horizon.

Bronell Series

The Bronell series consists of deep, well drained soils on fan terraces, ridges, fans, foot slopes, and a few steep back slopes. These soils formed in alluvium. Slopes range from 2 to 40 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Borollic Calciorthids.

Typical pedon of Bronell very gravelly loam, in an area of Bronell-Kerhayden complex, 10 to 40 percent slopes; 1,600 feet south and 500 feet west of the northeast corner of sec. 24, T. 48 N., R. 10 E.

A—0 to 6 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; moderate coarse granular structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel and 5 percent cobbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AB—6 to 11 inches; light brownish gray (10YR 6/2) very gravelly sandy clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; about 45 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—11 to 20 inches; pinkish gray (7.5YR 7/2) extremely gravelly sandy clay loam, brown (7.5YR 5/2) moist; massive; hard, friable, sticky and slightly plastic; about 55 percent gravel and 5 percent cobbles; violently effervescent; many fine irregularly shaped soft masses of secondary calcium carbonate; about 25 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

Bk2—20 to 40 inches; pinkish gray (7.5YR 6/2) very gravelly sandy clay loam, brown (7.5YR 5/2) moist; massive; hard, friable, sticky and slightly plastic; about 50 percent gravel; violently effervescent; finely divided secondary calcium carbonate disseminated throughout and coating rock fragments; about 14 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

Bk3—40 to 60 inches; pinkish gray (7.5YR 6/2) extremely gravelly sandy loam, brown (7.5YR 5/2) moist; massive; hard, friable, sticky and slightly plastic; about 65 percent gravel; violently effervescent; many large somewhat rounded soft masses of secondary calcium carbonate; about 10 percent calcium carbonate equivalent; moderately alkaline.

Secondary calcium carbonate is at a depth of 6 to 15 inches. Hue is 2.5Y to 7.5YR throughout the profile. The content of rock fragments in the particle-size control section is 35 to 80 percent by volume. The calcium carbonate equivalent is 15 to 40 percent in the Bk horizon. It is commonly greater than 20 percent.

The A horizon is mildly alkaline or moderately alkaline. It is gravelly sandy loam or very gravelly loam. The Bk horizon is very gravelly sandy loam, extremely gravelly sandy loam, very gravelly sandy clay loam, extremely gravelly sandy clay loam, very gravelly loam, or gravelly sandy loam.

Bronell Variant

The Bronell Variant consists of deep, well drained soils on canyonsides. These soils formed in colluvium derived dominantly from limestone. Slopes range from 30 to 60 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 47 to 52 degrees F. The soils are loamy-skeletal, mixed, mesic Ustollic Calciorthids.

Typical pedon of Bronell Variant very stony loam, in an area of Bronell Variant-Wesix-Rock outcrop complex, 30 to 60 percent slopes; about 5,000 feet north and

2,200 feet east of the southwest corner of sec. 33, T. 16 S., R. 70 W.

A—0 to 3 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 45 percent gravel, 25 percent cobbles, and 10 percent stones; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 10 inches; light brownish gray (10YR 6/2) very cobbly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, sticky and plastic; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—10 to 25 inches; pinkish white (7.5YR 8/2) very cobbly loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable, sticky and plastic; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; violently effervescent; about 55 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

Bk2—25 to 60 inches; light brown (7.5YR 6/4) very cobbly loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, sticky and plastic; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; strongly effervescent; about 10 percent calcium carbonate equivalent; moderately alkaline.

The content of rock fragments is 40 to 70 percent in the control section.

The Bronell Variant in Fremont County has a mesic temperature regime, which is outside the range for the Bronell series.

Bundo Series

The Bundo series consists of deep, well drained soils on north-facing mountainsides. These soils formed in colluvium derived from igneous rock, mainly andesite and rhyolite. Slopes range from 30 to 65 percent. The average annual precipitation is 17 to 25 inches, and the average annual air temperature is 38 to 42 degrees F. The soils are loamy-skeletal, mixed Typic Paleboralfs.

Typical pedon of Bundo very cobbly sandy loam, 30 to 60 percent slopes, about 2,400 feet north and 2,600 feet west of the southeast corner of sec. 5, T. 50 N., R. 12 E.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 2 inches; grayish brown (10YR 5/2) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure parting to weak fine subangular blocky; slightly hard, very friable, nonsticky and nonplastic; about 20 percent gravel, 20 percent cobbles, and 5 percent stones; slightly acid; abrupt smooth boundary.

E—2 to 18 inches; light gray (10YR 7/2) very cobbly sandy loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; about 20 percent gravel, 20 percent cobbles, and 5 percent stones; slightly acid; gradual wavy boundary.

E/Bt—18 to 27 inches; very pale brown (10YR 7/3) very cobbly sandy loam, brown (10YR 5/3) moist (E); lamellae of pale brown (10YR 6/3) very cobbly sandy clay loam, yellowish brown (10YR 5/4) moist (Bt); weak very fine granular structure in the E part and weak fine subangular blocky structure in the Bt part; soft, very friable, nonsticky and nonplastic in the E part and hard, very friable, slightly sticky and nonplastic in the Bt part; about 20 percent gravel, 25 percent cobbles, and 2 percent stones; moderately acid; gradual wavy boundary.

Bt/E—27 to 60 inches; yellowish brown (10YR 5/4) very cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist (Bt); very pale brown (10YR 7/3) very cobbly sandy loam, brown (10YR 5/3) moist (E); moderate fine subangular blocky structure in the Bt part and weak very fine granular structure in the E part; very hard, very friable, slightly sticky and slightly plastic in the Bt part and slightly hard, very friable, slightly sticky and nonplastic in the E part; common moderately thick clay films on faces of peds; about 25 percent gravel, 25 percent cobbles, and 5 percent stones; moderately acid.

The solum is more than 60 inches thick. Depth to the argillic horizon is 25 to 45 inches. Some pedons do not have an A horizon. Reaction is slightly acid or moderately acid in map unit 13 and is slightly acid or neutral in map unit 126.

The content of rock fragments is 35 to 50 percent in the A and E horizons. The E horizon is very cobbly loam, very cobbly sandy loam, or very gravelly sandy loam. The E/Bt and Bt/E horizons contain about 40 to 85 percent rock fragments. They are very cobbly sandy loam, sandy clay loam, or extremely gravelly sandy loam. The subsoil and substratum are very cobbly or extremely gravelly sandy clay loam.

Bushvalley Series

The Bushvalley series consists of shallow, well drained soils on mountainsides, hills, ridges, fan terraces, and mesas. These soils formed in residuum derived from tuff, breccia, granite, andesite, and rhyolite. Slopes range from 5 to 50 percent. The average annual precipitation is 15 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Argic Lithic Cryoborolls.

Typical pedon of Bushvalley cobbly loam, in an area of Bushvalley-Whiteman cobbly loams, 15 to 50 percent slopes; about 1,600 feet north and 2,100 feet east of the southwest corner of sec. 2, T. 51 N., R. 11 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to moderate fine granular; soft, very friable, sticky and slightly plastic; about 15 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.

BA—3 to 7 inches; dark brown (10YR 4/3) very cobbly clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; about 35 percent gravel and 20 percent cobbles; neutral; abrupt smooth boundary.

Bt—7 to 12 inches; brown (7.5YR 5/3) very cobbly clay loam, dark brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common moderately thick clay films on faces of peds; about 35 percent gravel and 20 percent cobbles; mildly alkaline; abrupt irregular boundary.

R—12 inches; hard tuff.

The depth to bedrock is 7 to 20 inches. The base of the Bt horizon is generally at the lithic contact. Reaction is slightly acid to mildly alkaline. The content of rock fragments is 35 to 80 percent in the control section.

The A horizon has hue of 7.5YR or 10YR. The Bt horizon is very cobbly clay loam, very cobbly sandy clay loam, extremely cobbly sandy clay loam, extremely cobbly clay loam, or very gravelly sandy clay loam.

Cascajo Series

The Cascajo series consists of deep, excessively drained soils on terrace edges, breaks, fan terraces, knobs, hills, and ridges. These soils formed in gravelly and sandy, calcareous alluvium. Slopes range from 10 to 40 percent. The average annual precipitation is 10 to 15 inches, and the average annual air temperature is about 49 to 53 degrees F. The soils are sandy-skeletal, mixed, mesic Ustollic Calciorthids.

Typical pedon of Cascajo very gravelly sandy loam, 10 to 40 percent slopes, about 1,000 feet south and 700 feet east of the northwest corner of sec. 5, T. 19 S., R. 70 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; about 35 percent gravel and 5 percent cobbles; very slightly effervescent; moderately alkaline; clear wavy boundary.

AB—3 to 6 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; about 45 percent gravel and 10 percent cobbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk—6 to 21 inches; white (10YR 8/2) extremely cobbly sandy loam, pale brown (10YR 6/3) moist; single grain; slightly hard, loose; about 35 percent gravel and 35 percent cobbles; thick coatings of calcium carbonate on pebbles; violently effervescent; about 30 percent calcium carbonate equivalent; moderately alkaline; diffuse wavy boundary.

C—21 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly sand, yellowish brown (10YR 5/4) moist; single grain; loose; about 35 percent gravel and 35 percent cobbles; slightly effervescent; moderately alkaline.

The texture of the A and C horizons ranges from very gravelly sandy loam to extremely cobbly sand. The content of rock fragments is 35 to 55 percent in the A horizon and 35 to 80 percent in the C horizon.

Cascajo Variant

The Cascajo Variant consists of deep, somewhat excessively drained soils on alluvial fans. These soils formed in alluvium. Slopes range from 5 to 12 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 44 to 46 degrees F. The soils are sandy-skeletal, mixed Cumulic Haploborolls.

Typical pedon of Cascajo Variant gravelly sandy loam, 5 to 12 percent slopes, about 2,000 feet west and 260 feet south of the northeast corner of sec. 20, T. 48 N., R. 11 E.

A—0 to 6 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; about 30 percent gravel; mildly alkaline; clear smooth boundary.

AC—6 to 31 inches; brown (10YR 5/3) very gravelly loamy sand, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; about 45 percent gravel; mildly alkaline; clear wavy boundary.

C1—31 to 50 inches; pale brown (10YR 6/3) very gravelly loamy fine sand, brown (10YR 4/3) moist;

massive; soft, nonsticky and nonplastic; about 35 percent gravel; mildly alkaline; gradual wavy boundary.

C2—50 to 60 inches; light yellowish brown (10YR 6/4) very gravelly sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; about 50 percent gravel; mildly alkaline.

The mollic epipedon is 20 to 40 inches thick. The content of rock fragments, dominantly subrounded pebbles ⅛ to ¼ inch in diameter, is 25 to 60 percent throughout the profile. Reaction is neutral or mildly alkaline. The C horizon is stratified with thin lenses of loam.

The Cascajo Variant in Fremont County has a mollic epipedon, has a frigid temperature regime, and does not have a calcic horizon. These characteristics are outside the range for the Cascajo series.

Casvare Series

The Casvare series consists of shallow, well drained soils on mountainsides. These soils formed in residuum derived from metasedimentary rock, gneiss, granite, and granodiorite. Slopes range from 20 to 50 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are loamy-skeletal, mixed, shallow Typic Haploborolls.

Typical pedon of Casvare very stony loam, in an area of Casvare-Teaspoon complex, 20 to 50 percent slopes; about 1,600 feet west and 600 feet north of the southeast corner of sec. 19, T. 49 N., R. 11 E.

Oe—1 inch to 0; pinyon litter.

A1—0 to 3 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; about 30 percent gravel, 10 percent cobbles, and 5 percent stones; mildly alkaline; abrupt smooth boundary.

A2—3 to 6 inches; grayish brown (10YR 5/2) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 45 percent gravel; mildly alkaline; clear smooth boundary.

AB—6 to 10 inches; grayish brown (10YR 5/2) extremely gravelly sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 80 percent gravel; mildly alkaline; clear wavy boundary.

Bk—10 to 17 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; about 40 percent rock structure; massive; soft, very friable, slightly sticky and nonplastic; about 80 percent gravel and 5 percent cobbles; violently effervescent; calcium carbonate coatings on rock fragments; moderately alkaline; clear wavy boundary.

Cr—17 to 24 inches; soft, weathered metasedimentary bedrock; visible secondary calcium carbonate occurring as coatings on rock faces.

R—24 inches; hard, fractured metasedimentary bedrock.

Paralithic contact is at a depth of 6 to 20 inches. The content of rock fragments is 35 to 90 percent. Before the top 7 inches are mixed, the mollic epipedon is 4 to 12 inches thick. Secondary calcium carbonate is at a depth of 6 to 12 inches. Hue is 2.5Y to 7.5YR throughout the profile.

The A horizon is neutral or mildly alkaline. The Bk horizon is very gravelly sandy loam, extremely gravelly sandy loam, or extremely gravelly loam.

Cathedral Series

The Cathedral series consists of shallow, well drained soils on mountainsides. These soils formed in colluvium and residuum derived dominantly from gneiss. Slopes range from 45 to 75 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Lithic Haploborolls.

Typical pedon of Cathedral very gravelly coarse sandy loam, in an area of Cathedral-Rock outcrop complex, 45 to 80 percent slopes; about 2,000 feet west and 1,000 feet north of the southeast corner of sec. 14, T. 19 S., R. 71 W.

A1—0 to 6 inches; grayish brown (10YR 5/2) very gravelly coarse sandy loam, very dark gray (10YR 3/1) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 10 percent cobbles, and 5 percent stones; neutral; abrupt smooth boundary.

A2—6 to 15 inches; dark grayish brown (10YR 4/2) extremely gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; abrupt smooth boundary.

C—15 to 19 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 20 percent cobbles, and 5 percent stones; slightly acid; abrupt irregular boundary.

R—19 inches; fractured gneiss bedrock.

The depth to bedrock is 10 to 20 inches. The mollic epipedon is 6 to 20 inches thick. The content of rock fragments is 35 to 85 percent. Reaction is slightly acid or neutral throughout the profile. Hue is 10YR or 7.5YR.

Cerrillos Series

The Cerrillos series consists of deep, well drained soils on fan terraces and fans. These soils formed in alluvium derived dominantly from red sandstone. Slopes range from 3 to 8 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 48 to 52 degrees F. The soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Cerrillos gravelly sandy loam, 3 to 8 percent slopes, about 2,250 feet east and 1,230 feet south of the northwest corner of sec. 9, T. 17 S., R. 70 W.

A—0 to 10 inches; reddish brown (5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; about 15 percent gravel; mildly alkaline; clear smooth boundary.

Bt—10 to 19 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common thin clay films on faces of peds; about 10 percent gravel; mildly alkaline; gradual smooth boundary.

Bk—19 to 31 inches; light reddish brown (5YR 6/3) sandy clay loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; about 10 percent gravel; violently effervescent; calcium carbonate disseminated throughout; moderately alkaline; gradual smooth boundary.

C1—31 to 39 inches; reddish brown (5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; violently effervescent; about 25 percent gravel; moderately alkaline; gradual smooth boundary.

C2—39 to 72 inches; reddish brown (5YR 5/4) silt loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, sticky and plastic; violently effervescent; about 10 percent gravel; moderately alkaline.

The content of rock fragments is 0 to 25 percent. The depth to secondary calcium carbonate and to the base of the argillic horizon is 11 to 20 inches. The calcium carbonate equivalent in the Bk horizon is more than 15 percent.

Chittum Series

The Chittum series consists of shallow, well drained soils on low hills and ridges. These soils formed in residuum derived dominantly from red sandstone. Slopes range from 5 to 20 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 42 to 46 degrees F. The soils are loamy, mixed Argic Lithic Cryoborolls.

Typical pedon of Chittum sandy loam, dry, 5 to 20 percent slopes, about 750 feet north and 1,250 feet east of the southwest corner of sec. 18, T. 51 N., R. 11 E.

A—0 to 4 inches; reddish brown (2.5YR 5/3) sandy loam, dark reddish brown (2.5YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; about 5 percent gravel; neutral; clear smooth boundary.

Bt—4 to 10 inches; reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common thin clay films on faces of peds; about 10 percent gravel; neutral; clear smooth boundary.

R—10 inches; dark reddish brown sandstone bedrock.

The depth to bedrock is 8 to 20 inches. The base of the argillic horizon is at a depth of 8 to 15 inches. The content of rock fragments is 5 to 35 percent. Hue is 2.5YR or 5YR throughout the profile. Reaction is slightly acid or neutral.

The B horizon is sandy clay loam, gravelly clay loam, or loam.

Coaldale Series

The Coaldale series consists of shallow, well drained soils on mountainsides. These soils formed in residuum derived dominantly from granite and gneiss. Slopes range from 20 to 45 percent. The average annual precipitation is about 12 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Borollic Lithic Haplargids.

Typical pedon of Coaldale very gravelly sandy loam, 20 to 45 percent slopes, about 1,000 feet north and 200 feet west of the southeast corner of sec. 3, T. 47 N., R. 11 E.

A—0 to 3 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 45 percent gravel; neutral; clear smooth boundary.

Bt—3 to 10 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common moderately thick clay films on faces of peds; about 55 percent gravel; neutral; clear smooth boundary.

Bk—10 to 18 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 55 percent gravel; few fine soft visible masses of calcium carbonate; strongly effervescent; moderately alkaline; clear irregular boundary.

R—18 inches; hard granodiorite bedrock.

The depth to bedrock is 10 to 20 inches. The depth to secondary calcium carbonate is 6 to 15 inches. The content of rock fragments, dominantly angular pebbles, is 35 to 90 percent throughout the profile. Hue is 10YR or 7.5YR throughout the profile.

The A horizon is slightly acid to mildly alkaline. The Bt horizon is very gravelly clay loam or very gravelly sandy clay loam. It is neutral or mildly alkaline.

Cochetopa Series

The Cochetopa series consists of deep, well drained soils on fans and in swales. These soils formed in alluvium. Slopes range from 2 to 6 percent. The average annual precipitation is 17 to 20 inches, and the average annual air temperature is 38 to 42 degrees F. The soils are fine, montmorillonitic Argic Pachic Cryoborolls.

Typical pedon of Cochetopa clay loam, 2 to 6 percent slopes, about 2,500 feet north and 1,000 feet east of the southwest corner of sec. 23, T. 16 S., R. 73 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable, sticky and plastic; about 10 percent gravel; neutral; abrupt smooth boundary.

Bt1—5 to 17 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate and strong medium prismatic structure parting to strong medium angular blocky; very hard, firm, very sticky and plastic; continuous thick clay films on faces of peds and lining interstitial pores; about 10 percent gravel; neutral; clear smooth boundary.

Bt2—17 to 27 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate and strong medium prismatic structure parting to strong medium angular blocky; very hard, firm, very sticky and plastic; continuous thick clay films on faces of peds and lining interstitial pores; about 10 percent gravel; neutral; clear smooth boundary.

Bt3—27 to 32 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; few medium distinct strong brown (7.5YR 5/8) mottles; moderate medium angular blocky structure; hard, friable, sticky and plastic; common moderately thick clay films on faces of peds and lining interstitial pores; about 10 percent gravel; neutral; clear smooth boundary.

C1—32 to 54 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) and dark grayish brown (10YR 4/2) moist; few medium distinct strong brown (7.5YR 5/8) mottles; massive; hard, friable, sticky and plastic; about 10 percent gravel; mildly alkaline; gradual wavy boundary.

C2—54 to 60 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; mildly alkaline.

The mollic epipedon is 16 to 36 inches thick, and the solum is 31 to 48 inches thick. Hue is 7.5YR or 10YR throughout the profile. Reaction is neutral or mildly alkaline. The content of rock fragments is 0 to 20 percent in the control section.

The Bt horizon is clay loam, gravelly clay loam, or clay. The C horizon is clay loam, loam, gravelly loam, or cobbly loam.

Corpening Series

The Corpening series consists of shallow, well drained soils on ridges and hills. These soils formed in residuum derived dominantly from gneiss and granite. Slopes range from 5 to 25 percent. The average annual precipitation is 15 or 16 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are loamy, mixed Lithic Haploborolls.

Typical pedon of Corpening gravelly loam, 5 to 25 percent slopes, about 1,600 feet south and 1,100 feet west of the northeast corner of sec. 3, T. 1 S., R. 71 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 25 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A2—4 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 30 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C—10 to 12 inches; pale brown (10YR 6/3) gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; about 30 percent gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—12 inches; gneiss bedrock.

The depth to bedrock is 4 to 20 inches. The mollic epipedon is 6 to 15 inches thick. The content of rock fragments is 10 to 35 percent. The fragments are mainly subangular and are ⅛ to ¼ inch in diameter. Hue is 7.5YR or 10YR throughout the profile.

The C horizon is gravelly loam or gravelly sandy clay loam.

Cryoborolls

Cryoborolls are deep, well drained soils on foot slopes and in swales in the mountains. These soils formed in colluvium and alluvium derived from igneous rock, mainly andesite and rhyolite. Slopes range from 15 to 35 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 42 degrees F.

Reference pedon of Cryoborolls, 15 to 35 percent slopes, in a road cut about 100 feet south and 700 feet east of the northwest corner of sec. 8, T. 50 N., R. 12 E.

A1—0 to 3 inches; dark gray (10YR 4/1) gravelly loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; about 25 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

A2—3 to 11 inches; brown (10YR 5/3) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 40 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

E—11 to 17 inches; brown (10YR 5/3) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

E/Bt—17 to 22 inches; brown (10YR 5/3) very gravelly fine sandy loam in the E part and very gravelly sandy clay loam in the Bt part, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; about 45 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

Bt—22 to 37 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common moderately thick clay films on faces of peds; about 45 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

BC—37 to 54 inches; light brownish gray (10YR 6/2) very cobbly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; about 10 percent gravel and 40 percent cobbles; neutral; gradual wavy boundary.

C—54 to 60 inches; light brownish gray (10YR 6/2) very cobbly loamy sand, very dark grayish brown (10YR 3/2) moist; single grain; loose, nonsticky and nonplastic; about 10 percent gravel and 40 percent cobbles; neutral.

The content of rock fragments, dominantly gravel and cobbles, is 5 to 80 percent. The Bt and C horizons are moderately acid to mildly alkaline. Hue is mainly 7.5YR or 10YR throughout the profile. The dark surface layer is 10 to 24 inches thick. Many pedons do not have an E horizon.

The A horizon is gravelly loam, stony loam, loam, gravelly sandy clay loam, gravelly sandy loam, gravelly fine sandy loam, or very gravelly fine sandy loam. The B horizon is very gravelly sandy clay loam, clay loam, loam, gravelly loam, gravelly clay loam, or very gravelly clay loam. The C horizon is very cobbly loamy sand, very cobbly sandy loam, very gravelly sandy clay loam, very gravelly clay loam, gravelly clay loam, or clay loam.

Cumulic Cryaquolls

Cumulic Cryaquolls are deep, very poorly drained soils on stream terraces. These soils formed in alluvium. Slopes range from 2 to 5 percent. The average annual precipitation is 16 to 20 inches, and the average annual air temperature is 40 to 44 degrees F.

Reference pedon of Cumulic Cryaquolls, 2 to 5 percent slopes, about 1,650 feet south and 1,650 feet west of the northeast corner of sec. 34, T. 16 S., R. 73 W.

A1—0 to 10 inches; gray (10YR 5/1) clay loam, very dark grayish brown (10YR 3/2) moist; common fine distinct strong brown (7.5YR 4/6) mottles; weak medium granular structure; hard, friable, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.

A2—10 to 25 inches; gray (10YR 5/1), stratified clay loam, silty clay loam, and sandy clay loam, very dark grayish brown (10YR 3/2) moist; fine and medium distinct strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

Cg1—25 to 30 inches; gray (10YR 5/1) sandy clay loam, very dark gray (10YR 3/1) moist; many fine and medium distinct strong brown (7.5YR 4/6) mottles; massive; hard, friable, sticky and slightly plastic; about 5 percent gravel; mildly alkaline; clear wavy boundary.

Cg2—30 to 46 inches; gray (10YR 5/1), stratified sandy clay loam, silty clay loam, and clay loam, very dark gray (10YR 3/1) moist; many fine and medium strong brown (7.5YR 4/6) mottles; massive; very hard, firm, sticky and plastic; neutral; gradual wavy boundary.

Cg3—46 to 60 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; common fine and medium strong brown (7.5YR 4/6) mottles; massive; very hard, firm, sticky and plastic; neutral.

The content of rock fragments above a depth of about 40 inches is 0 to 40 percent. Hue is 10YR or 7.5YR throughout the profile. The water table is usually at the surface to a depth about 24 inches. Thickness of the mollic epipedon is 24 inches or more. Reaction is neutral to moderately alkaline throughout the profile.

The A horizon is clay loam, loam, sandy loam, or gravelly sandy loam. The C horizon is silt loam, silty clay loam, sandy clay loam, clay loam, gravelly silt loam, gravelly sandy loam, or gravelly sandy clay loam. In some pedons the lower part of the substratum is extremely gravelly sand.

Curecanti Series

The Curecanti series consists of deep, well drained soils on fans and fan terraces. These soils formed in alluvium. Slopes range from 4 to 45 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 44 to 46 degrees F. The soils are loamy-skeletal, mixed Typic Argiborolls.

Typical pedon of Curecanti gravelly sandy loam, 4 to 10 percent slopes, about 1,500 feet west and 2,000 feet south of the northeast corner of sec. 30, T. 42 N., R. 12 E.

A1—0 to 3 inches; brown (7.5YR 5/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; about 20 percent gravel and 10 percent cobbles; neutral; clear smooth boundary.

A2—3 to 10 inches; brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.

Bt—10 to 28 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; many moderately thick clay films on faces of peds; about 20 percent gravel and 30 percent cobbles; neutral; clear wavy boundary.

2BC—28 to 40 inches; brown (7.5YR 5/4) extremely cobbly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; about 30 percent gravel, 40 percent cobbles, and 5 percent stones; mildly alkaline; gradual wavy boundary.

2C—40 to 60 inches; light brown (7.5YR 6/3) extremely cobbly sandy loam, brown (7.5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; about 30 percent gravel, 40 percent cobbles, and 5 percent stones; mildly alkaline.

The mollic epipedon is 10 to 14 inches thick. The solum is 30 to 50 inches thick. The content of rock fragments is 35 to 75 percent in the control section.

The A horizon has hue of 10YR or 7.5YR. It is gravelly sandy loam or very cobbly sandy loam. The Bt horizon is very cobbly clay loam, extremely cobbly sandy loam, very cobbly sandy clay loam, or extremely cobbly sandy clay loam. It has hue of 10YR to 5YR. The 2C horizon is extremely cobbly sandy loam, very cobbly sandy loam, extremely stony sandy loam, extremely cobbly coarse sandy clay loam, or extremely cobbly loamy coarse sand. It is neutral or mildly alkaline. It has hue of 10YR to 5YR.

Curecanti Variant

The Curecanti Variant consists of deep, well drained soils on mesas and cuestas. These soils formed in alluvium derived dominantly from sandstone. Slopes range from 8 to 20 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 47 to 49 degrees F. The soils are clayey-skeletal, montmorillonitic, mesic Aridic Argiustolls. Typically, the surface is covered with 1 to 3 percent stones.

Typical pedon of Curecanti Variant extremely cobbly loam, 8 to 20 percent slopes, very stony, about 1,000 feet south and 2,300 feet west of the northeast corner of sec. 22, T. 17 S., R. 68 W.

A—0 to 8 inches; dark gray (10YR 4/1) extremely cobbly loam, black (10YR 2/1) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; about 30 percent gravel, 25 percent cobbles, and 10 percent stones; slightly acid; clear smooth boundary.

Bt—8 to 15 inches; reddish brown (5YR 4/4) very cobbly clay, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to strong angular blocky; extremely hard, very firm, very sticky and very plastic; continuous thick clay films on faces of peds and rock fragments and lining pores; about 30 percent gravel, 20 percent cobbles, and 3 percent stones; neutral; abrupt smooth boundary.

Btk—15 to 18 inches; reddish brown (5YR 4/4) very cobbly clay, yellowish red (5YR 4/6) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; thick continuous clay films on faces of peds and rock fragments and lining pores; about 30 percent gravel, 20 percent cobbles, and 3 percent stones; few fine filaments and soft masses of calcium carbonate; neutral; abrupt smooth boundary.

Bk—18 to 50 inches; pink (7.5YR 7/4) very cobbly clay loam, reddish yellow (7.5YR 7/6) moist; massive; very hard, firm, sticky and plastic; about 30 percent gravel, 20 percent cobbles, and 3 percent stones; soft calcium carbonate disseminated throughout; violently effervescent; moderately alkaline; abrupt wavy boundary.

R—50 inches; sandstone bedrock.

The depth to bedrock is 40 to 70 inches. The content of rock fragments is 35 to 60 percent in the control section. The mollic epipedon is 7 to 10 inches thick. The depth to accumulated calcium carbonate is 10 to 20 inches.

The A horizon is slightly acid or neutral. The Bt horizon has hue of 5YR or 7.5YR. It is very gravelly clay, very cobbly clay, or very cobbly clay loam. The Bk horizon is very gravelly clay loam, very cobbly clay loam, or very cobbly loam.

Ess Series

The Ess series consists of deep, well drained soils on mountainsides, hills, fan terraces, and mesas. These soils formed in colluvium derived dominantly from breccia, tuff, granite, and gneiss. Slopes range from 10 to 50 percent. The average annual precipitation is 15 to 20 inches, and the average annual air temperature is 38 to 44 degrees F. The soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Ess very gravelly sandy clay loam, 20 to 45 percent slopes, in an unsectionalized area about 3,700 feet south and 1,400 feet west of the southeast corner of sec. 31, T. 17 S., R. 73 W.

A1—0 to 5 inches; dark brown (7.5YR 4/2) very gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, sticky and slightly plastic; about 45 percent gravel and 10 percent cobbles; neutral; abrupt smooth boundary.

A2—5 to 12 inches; dark brown (7.5YR 4/2) very gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; slightly hard, very friable, sticky and slightly plastic; about 55 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

Bt1—12 to 17 inches; light brown (7.5YR 6/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many moderately thick clay films on faces of peds; about 55 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

Bt2—17 to 30 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many moderately thick clay films on faces of peds; about 55 percent gravel and 5 percent cobbles; mildly alkaline; gradual smooth boundary.

Bt3—30 to 40 inches; brown (7.5YR 5/3) very gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few thin clay films on faces of peds; about 50 percent gravel and 5 percent cobbles; mildly alkaline; gradual wavy boundary.

C—40 to 60 inches; light brown (7.5YR 6/4) very gravelly sandy loam, dark brown (7.5YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; about 55 percent gravel and 5 percent cobbles; mildly alkaline.

The mollic epipedon is 7 to 15 inches thick. The content of rock fragments is 35 to 90 percent in the control section. Hue is 7.5YR or 10YR throughout the profile.

The A horizon is slightly acid or neutral. It is very gravelly sandy clay loam or very gravelly loam. The Bt horizon is neutral or mildly alkaline. It is very gravelly sandy clay loam, extremely gravelly sandy clay loam, very cobbly sandy clay loam, extremely cobbly sandy clay loam, very cobbly clay loam, or very gravelly clay loam. The C horizon is very gravelly sandy loam, very cobbly sandy loam, extremely cobbly sandy loam, or very gravelly sandy clay loam.

Fort Collins Series

The Fort Collins series consists of deep, well drained soils on plains, fans, and fan terraces. These soils formed in alluvium. Slopes range from 0 to 5 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 49 to 53 degrees F. The soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Fort Collins loam, cool, 0 to 2 percent slopes, about 500 feet north and 550 feet west of the southeast corner of sec. 8, T. 19 S., R. 70 W.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

Bt—4 to 16 inches; yellowish brown (10YR 5/3) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many thin clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—16 to 21 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine filaments of secondary calcium carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—21 to 32 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common fine filaments of secondary calcium carbonate; slightly effervescent; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline.

Depth to the base of the Bt horizon is 15 to 30 inches. The content of rock fragments is 0 to 15 percent. Calcareous material is at a depth of 8 to 20 inches.

The A and Bt horizons are neutral or mildly alkaline. The Bt horizon is generally clay loam or loam. In some pedons it is sandy clay loam. The C horizon is loam, clay loam, or sandy clay loam.

Fort Collins Variant

The Fort Collins Variant consists of deep, well drained soils on fan terraces. These soils formed in alluvium. Slopes range from 3 to 8 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 44 to 47 degrees F. The soils are fine-loamy, mixed Borollic Haplargids.

Typical pedon of Fort Collins Variant loam, 3 to 8 percent slopes, about 2,200 feet south and 600 feet east of the northwest corner of sec. 22, T. 16 S., R. 70 W.

A—0 to 4 inches; brown (10YR 5/3) loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; neutral; clear smooth boundary.

Bt—4 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many moderately thick clay films on faces of peds; neutral; clear smooth boundary.

Bk1—9 to 13 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; strongly effervescent; few fine soft masses of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Bk2—13 to 35 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—35 to 60 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few fine filaments of calcium carbonate; strongly effervescent; moderately alkaline.

The content of rock fragments is 0 to 15 percent. Hue is 10YR or 7.5YR throughout the profile.

The A and Bt horizons are neutral or mildly alkaline. The Bt horizon is clay loam or sandy clay loam. The Bk horizon is loam or sandy loam.

Gaynor Series

The Gaynor series consists of moderately deep, well drained soils on fans, side slopes, and foot slopes. These soils formed in alluvium and residuum derived from shale. Slopes range from 0 to 12 percent. The average annual precipitation is 12 or 13 inches, and the average annual air temperature is 51 to 53 degrees F.

The soils are fine, montmorillonitic (calcareous), mesic Ustic Torriorthents.

Typical pedon of Gaynor silty clay loam, in an area of Limon-Gaynor silty clay loams, 0 to 3 percent slopes; about 1,750 feet north and 2,640 feet west of the southeast corner of sec. 22, T. 18 S., R. 70 W.

A—0 to 4 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; moderately alkaline; strongly effervescent; clear smooth boundary.

AC—4 to 16 inches; grayish brown (10YR 5/2) silty clay, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; extremely hard, firm, sticky and plastic; moderately alkaline; strongly effervescent; gradual irregular boundary.

C—16 to 22 inches; grayish brown (10YR 5/2) silty clay, dark brown (10YR 4/3) moist; massive; very hard, firm, sticky and plastic; moderately alkaline; strongly effervescent; gradual wavy boundary.

Cr—22 inches; fractured, calcareous shale.

The depth to shale ranges from 20 to 40 inches. The soils are nonsaline or slightly saline. The C horizon is silty clay or silty clay loam.

The Gaynor soil in map unit 63 is moderately well drained or somewhat poorly drained.

Granile Series

The Granile series consists of deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone and granodiorite. Slopes range from 4 to 50 percent. The average annual precipitation is 14 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Granile very gravelly sandy loam, 25 to 45 percent slopes, about 100 feet north and 2,100 feet west of the southeast corner of sec. 35, T. 48 N., R. 10 E.

Oi—2 inches to 0; fir litter.

A—0 to 2 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; about 50 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

E—2 to 11 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 50 percent gravel and 5 percent cobbles; strongly acid; abrupt smooth boundary.

EB—11 to 19 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 70 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

Bt1—19 to 32 inches; brownish yellow (10YR 6/6) extremely gravelly sandy clay loam, yellowish brown (10YR 5/6) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few thin clay films on faces of peds and rock fragments and lining pores; about 75 percent gravel and 10 percent cobbles; strongly acid; clear wavy boundary.

Bt2—32 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; common moderately thick clay films on faces of peds and rock fragments and lining pores; about 75 percent gravel and 10 percent cobbles; slightly acid.

The content of rock fragments, mainly angular pebbles and some channers and cobbles, is 35 to 85 percent. Reaction is strongly acid to neutral throughout the profile. Hue is 10YR or 7.5YR. The base of the argillic horizon is at a depth of 20 to 50 inches.

The E horizon is gravelly sandy loam, very gravelly sandy loam, or extremely gravelly sandy loam. The Bt horizon is very gravelly sandy clay loam, extremely gravelly sandy clay loam, very gravelly clay loam, extremely gravelly coarse sandy loam, or extremely gravelly sandy loam. The C horizon, if it occurs, is very gravelly sandy loam, extremely gravelly sandy loam, extremely gravelly coarse sandy loam, or extremely gravelly loamy coarse sand.

Guffey Series

The Guffey series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from granodiorite. Slopes range from 20 to 50 percent. The average annual precipitation is 14 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Guffey very gravelly sandy loam, in an area of Granile-Guffey very gravelly sandy loams, 25 to 50 percent slopes; about 1,400 feet north and 2,400 feet west of the southeast corner of sec. 17, T. 49 N., R. 11 E.

Oe—1 inch to 0; partially decomposed organic matter, mainly needles, bark, and twigs.

A—0 to 2 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 45 percent gravel and 10 percent cobbles; slightly acid; abrupt smooth boundary.

E—2 to 13 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 55 percent gravel; slightly acid; clear smooth boundary.

Bt—13 to 23 inches; brown (7.5YR 5/2) extremely gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many thin clay films on faces of peds and on rock fragments; about 75 percent gravel; slightly acid; gradual wavy boundary.

C—23 to 30 inches; reddish yellow (7.5YR 7/6) extremely gravelly coarse sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, very friable, nonsticky and nonplastic; about 75 percent gravel; slightly acid; gradual wavy boundary.

Cr—30 inches; partially weathered granodiorite (grus).

The depth to bedrock and the thickness of the solum are 20 to 40 inches. The content of rock fragments, dominantly angular pebbles ⅓ to ½ inch in diameter, is 35 to 85 percent. Hue is 10YR or 7.5YR throughout the profile. Reaction is neutral to strongly acid.

The E horizon is very gravelly sandy loam or extremely gravelly sandy loam. The Bt horizon is extremely gravelly sandy loam to extremely gravelly sandy clay loam. The C horizon is extremely gravelly coarse sandy loam or extremely gravelly coarse loamy sand.

Haploborolls

Haploborolls are shallow or moderately deep, well drained or somewhat excessively drained soils on mainly north-facing mountainsides. These soils formed in residuum and colluvium derived dominantly from gneiss and granite. Slopes range from 40 to 70 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 43 to 46 degrees F. Typically, the surface is covered with 1 to 2 percent stones.

Reference pedon of Haploborolls, in an area of Haploborolls, very stony-Rock outcrop complex, 40 to 90 percent slopes; in an unsectionalized area about 3,600 feet north and 2,300 feet west of the northeast corner of sec. 31, T. 18 S., R. 72 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) extremely gravelly sandy loam, dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel, 10 percent cobbles, and 15 percent stones; slightly acid; abrupt smooth boundary.

A2—2 to 7 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 35 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

C—7 to 12 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; about 30 percent gravel and 5 percent cobbles; neutral; clear irregular boundary.

Cr—12 to 21 inches; soft, weathered gneiss.

R—21 inches; hard gneiss bedrock.

The depth to bedrock is mainly 4 to 20 inches. In some pedons, however, it is 20 to 40 inches. The mollic epipedon is 4 to 8 inches thick in areas of soils that are underlain by bedrock above a depth of 20 inches. It is 7 or more inches thick in areas of soils that are underlain by bedrock between depths of 20 and 40 inches. The content of rock fragments is 35 to 85 percent. Hue is 10YR or 7.5YR throughout the profile. Reaction is mainly slightly acid to mildly alkaline but is moderately alkaline in some pedons. Some pedons have a thin, calcareous C horizon that is directly above the bedrock.

Heath Series

The Heath series consists of deep, well drained soils on hills. These soils formed in alluvium and residuum derived dominantly from arkosic conglomerate. Slopes range from 5 to 30 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are fine, montmorillonitic Argic Cryoborolls.

Typical pedon of Heath cobbly loam, 5 to 30 percent slopes, about 1,600 feet east and 1,800 feet south of the northwest corner of sec. 15, T. 16 S., R. 71 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; about 15 percent gravel, 15 percent cobbles, and 2 percent stones; slightly acid; clear smooth boundary.

BA—7 to 10 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; about 5 percent gravel; neutral; clear wavy boundary.

Bt1—10 to 15 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; continuous thin clay films on faces of peds; neutral; clear wavy boundary.

Bt2—15 to 27 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to strong medium and fine subangular blocky; very hard, firm, very sticky and very plastic; continuous thin clay films on faces of peds; neutral; clear wavy boundary.

Bk1—27 to 32 inches; light brownish gray (2.5Y 6/2) clay, light yellowish brown (2.5Y 6/4) moist; weak medium angular blocky structure; extremely hard, firm, very sticky and very plastic; common large soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—32 to 48 inches; light brownish gray (2.5Y 6/2) clay, light yellowish brown (2.5Y 6/3) moist; massive; extremely hard, very firm, very sticky and very plastic; common large soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—48 to 60 inches; light brownish gray (2.5Y 6/2) clay, olive brown (2.5Y 4/4) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 15 inches thick. The base of the Bt horizon is at a depth of 20 to 40 inches. Hue is 2.5Y to 7.5YR throughout the profile. The content of rock fragments is 0 to 35 percent in the control section. The depth to secondary calcium carbonate is 20 to 40 inches. The calcium carbonate equivalent is 5 to 15 percent.

The A horizon is slightly acid or neutral. The Bt horizon is clay loam or clay. It is neutral or mildly alkaline. The Bk and C horizons are mildly alkaline or moderately alkaline.

Herakle Series

The Herakle series consists of shallow, well drained soils on mountainsides and hogbacks. These soils formed in residuum derived from limestone. Slopes range from 15 to 45 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Lithic Cryoboralfs.

Typical pedon of Herakle very channery loam, in an area of Herakle-Rock outcrop complex, 15 to 45 percent slopes; about 2,500 feet south and 2,500 feet west of the northeast corner of sec. 19, T. 51 N., R. 11 E.

A—0 to 2 inches; brown (7.5YR 5/2) very channery loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; about 50 percent channers and 5 percent flagstones; mildly alkaline; abrupt smooth boundary.

E—2 to 7 inches; brown (7.5YR 5/2) very channery loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; about 40 percent channers; calcareous; mildly alkaline; clear smooth boundary.

Btk—7 to 13 inches; brown (10YR 5/3) very channery clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 45 percent channers; few fine soft masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—13 to 17 inches; gray (10YR 7/2) very channery loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, slightly sticky and nonplastic; about 55 percent channers; calcium carbonate disseminated throughout; violently effervescent; moderately alkaline; gradual wavy boundary.

R—17 inches; hard, fractured limestone bedrock.

The depth to bedrock is 10 to 20 inches. The content of rock fragments is 35 to 80 percent. The calcium carbonate equivalent in the Bk horizon is 15 to 35 percent. Hue is 10YR or 7.5YR throughout the profile.

The E horizon is neutral or mildly alkaline. The B horizon is neutral to moderately alkaline.

Hodden Series

The Hodden series consists of deep, well drained soils on fan terraces, fans, and foot slopes. These soils formed in alluvium. Slopes range from 3 to 8 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Hodden gravelly loam, 3 to 8 percent slopes, about 1,350 feet east and 1,580 feet north of the southwest corner of sec. 6, T. 51 N., R. 11 E.

A—0 to 4 inches; dark brown (7.5YR 4/2) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 20 percent gravel and 1 percent cobbles; neutral; abrupt smooth boundary.

Bt1—4 to 10 inches; dark brown (7.5YR 4/2) very gravelly loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds and lining pores; about 40 percent gravel and 1 percent cobbles; neutral; abrupt smooth boundary.

Bt2—10 to 13 inches; strong brown (7.5YR 4/6) very gravelly clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds and lining pores; about 45 percent gravel and 1 percent cobbles; mildly alkaline; abrupt smooth boundary.

Bk1—13 to 16 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, brown or dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many medium soft masses of calcium carbonate; violently effervescent; about 45 percent gravel and 10 percent cobbles; moderately alkaline; abrupt smooth boundary.

Bk2—16 to 32 inches; pinkish white (7.5YR 8/2) very gravelly sandy loam, pink (7.5YR 7/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; calcium carbonate disseminated throughout and in many large soft masses; violently effervescent; about 25 percent calcium carbonate equivalent; about 45 percent gravel and 10 percent cobbles; moderately alkaline; clear smooth boundary.

Bk3—32 to 44 inches; pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; calcium carbonate disseminated throughout and in few medium soft masses; violently effervescent; about 45 percent gravel and 10 percent cobbles; moderately alkaline; clear wavy boundary.

2C—44 to 60 inches; pinkish gray (7.5YR 7/2) extremely gravelly loamy sand, brown (7.5YR 5/2) moist; single grain; loose, nonsticky and nonplastic; coatings of calcium carbonate on the underside of rock fragments; slightly effervescent; about 65 percent gravel and 5 percent cobbles; moderately alkaline.

The depth to bedrock is about 60 inches or more. The mollic epipedon is 8 to 14 inches thick. The depth to secondary calcium carbonate and to the base of the argillic horizon is 10 to 18 inches. The content of rock fragments is 35 to 55 percent in the control section. Hue is 7.5YR or 10YR throughout the profile.

The Bt horizon is very gravelly loam, very gravelly sandy clay loam, and very gravelly clay loam. It is neutral or mildly alkaline. The Bk horizon is very gravelly sandy clay loam, very gravelly sandy loam, extremely gravelly sandy loam, or extremely cobbly sandy loam. The content of rock fragments is 40 to 90 percent in the Bk horizon. The calcium carbonate equivalent ranges from 15 to 30 percent. The content of rock fragments is 40 to 90 percent in the 2C horizon.

Hoodle Series

The Hoodle series consists of deep, well drained soils on foot slopes and fan terraces. These soils formed in colluvium and alluvium. Slopes range from 5 to 20 percent. The average annual precipitation is 18 to 20 inches, and the average annual air temperature is 38 to 42 degrees F. The soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Hoodle loam, 5 to 20 percent slopes, about 300 feet south and 300 feet east of the northwest corner of sec. 6, T. 51 N., R. 11 E.

A—0 to 10 inches; very dark grayish brown (7.5YR 3/2) loam, very dark brown (7.5YR 2/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; about 5 percent gravel; neutral; abrupt smooth boundary.

Bt1—10 to 14 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; few thin clay films on faces of peds; about 50 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

Bt2—14 to 21 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common thin clay films on faces of peds; about 50 percent gravel and 5 percent cobbles; neutral; abrupt wavy boundary.

Bt3—21 to 26 inches; yellowish brown (10YR 5/4) extremely gravelly sandy clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few thin clay films on faces of peds; about 65 percent gravel and 5 percent cobbles; slightly effervescent; mildly alkaline; clear wavy boundary.

2Bk1—26 to 39 inches; white (10YR 8/2) extremely gravelly sandy clay loam, pale brown (10YR 6/3) moist; massive; slightly sticky and slightly plastic; about 65 percent gravel and 10 percent cobbles; violently effervescent; about 30 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

2Bk2—39 to 60 inches; very pale brown (10YR 7/4) extremely gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; about 65 percent gravel and 10 percent cobbles; violently effervescent; about 14 percent calcium carbonate equivalent; moderately alkaline.

The depth to secondary calcium carbonate is 14 to 30 inches. The mollic epipedon is 8 to 15 inches thick.

The Bt horizon is neutral or mildly alkaline. It is very gravelly sandy clay loam, very cobbly sandy clay loam, very cobbly clay loam, very gravelly clay loam, or very gravelly sandy loam. The Bk horizon is very gravelly sandy clay loam, extremely gravelly sandy clay loam, very gravelly sandy loam, or very cobbly sandy loam.

Jodero Series

The Jodero series consists of deep, well drained soils on stream terraces and fans. These soils formed in mixed alluvium. Slopes range from 2 to 5 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are fine-loamy, mixed Cumulic Haploborolls.

Typical pedon of Jodero sandy loam, 2 to 5 percent slopes, about 2,100 feet north and 800 feet west of the southeast corner of sec. 1, T. 47 N., R. 12 E.

A1—0 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 10 percent gravel; slightly effervescent; mildly alkaline; clear wavy boundary.

A2—10 to 30 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; slightly effervescent; moderately alkaline; clear wavy boundary.

A3—30 to 45 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; massive; hard, friable, sticky and slightly plastic; slightly effervescent; moderately alkaline; clear wavy boundary.

2C—45 to 60 inches; dark grayish brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; about 50 percent gravel; neutral.

The mollic epipedon is 40 to more than 60 inches thick. The content of rock fragments is 0 to 15 percent in the control section.

Some pedons have a C horizon within a depth of 40 inches. This horizon has hue of 10YR or 7.5YR. It is loam, clay loam, sandy clay loam, or fine sandy loam.

Jodero Variant

The Jodero Variant consists of deep, moderately well drained soils on stream terraces. These soils formed in alluvium. Slopes range from 1 to 3 percent. The average annual precipitation is 13 to 16 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are fine-silty, mixed Cumulic Cryoborolls.

Typical pedon of Jodero Variant clay loam, 1 to 3 percent slopes, about 1,400 feet west and 200 feet south of the northeast corner of sec. 13, T. 51 N., R. 10 E.

A1—0 to 4 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to weak fine granular; soft, very friable, sticky and plastic; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A2—4 to 12 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to moderate fine granular; slightly hard, very friable, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

A3—12 to 31 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; slightly hard, very friable, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

A4—31 to 39 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; slightly hard, very friable, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

A5—39 to 50 inches; gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to strong very fine subangular blocky; hard, firm, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

A6—50 to 60 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; slightly hard, very friable, very sticky and very plastic; strongly effervescent; moderately alkaline.

The mollic epipedon is 30 to 60 inches thick. The content of rock fragments is 0 to 15 percent. Hue is 7.5YR or 10YR throughout the profile.

The A horizon is clay loam, loam, silt loam, or silty clay loam.

The Jodero Variant in Fremont County has a cryic temperature regime and a fine-silty particle size in the control section. These characteristics are outside the range for the Jodero series.

Kerhayden Series

The Kerhayden series consists of deep, well drained soils on hills and ridges of deeply dissected fan terraces. These soils formed in stratified alluvium derived from mixed volcanic and igneous rock. Slopes range from 10 to 30 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 43 to 47 degrees F. The soils are fine-loamy, mixed (calcareous), frigid Ustic Torriorthents.

Typical pedon of Kerhayden gravelly sandy loam, in an area of Bronell-Kerhayden complex, 10 to 40 percent slopes; about 2,600 feet north and 1,400 feet east of the southwest corner of sec. 19, T. 48 N., R. 11 E.

A—0 to 3 inches; light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 5/4) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AB—3 to 8 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 10 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—8 to 22 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive; hard, firm, slightly sticky and nonplastic; about 10 percent gravel; many fine soft masses and filaments of soft calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—22 to 44 inches; light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 5/4) moist; massive; extremely hard, firm, slightly sticky and nonplastic; about 30 percent gravel; many fine soft masses and filaments of soft calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—44 to 60 inches; light reddish brown (5YR 6/3) extremely gravelly sandy loam, reddish brown (5YR 5/3) moist; massive; extremely hard, very firm, nonsticky and nonplastic; about 65 percent gravel; many fine soft masses and filaments of soft calcium carbonate; strongly effervescent; moderately alkaline.

The Bk horizon is sandy loam, loam, gravelly loam, sandy clay loam, gravelly sandy clay loam, or extremely gravelly sandy loam. The content of rock fragments above a depth of 40 inches is 5 to 30 percent. In some pedons the content of rock fragments in strata is as much as 70 percent.

Kim Series

The Kim series consists of deep, well drained soils on fans, plains, side slopes, fan terraces, stream terraces, and terrace breaks. These soils formed in alluvium and in eolian material. Slopes range from 0 to 15 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is about 48 to 53 degrees F. The soils are fine-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Kim loam, 3 to 8 percent slopes, about 2,440 feet west and 50 feet south of the northeast corner of sec. 11, T. 19 S., R. 70 W.

A—0 to 4 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—4 to 10 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—10 to 44 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; inconsistent deposits of secondary calcium carbonate occurring as coatings on peds and as mycelia; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—44 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak coarse prismatic structure; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Hue is 2.5Y to 7.5YR throughout the profile. The soils are calcareous to a depth of 6 inches. The content of rock fragments is 0 to 15 percent.

The A horizon is mildly alkaline or moderately alkaline. It is loam or fine sandy loam. The C horizon is loam, clay loam, or sandy clay loam. In some pedons it is fine sandy loam in the lower part.

The Kim soil in map unit 51 is moderately well drained or somewhat poorly drained.

Lakehelen Series

The Lakehelen series consists of moderately deep, well drained soils on mountainsides and canyonsides. These soils formed in colluvium and residuum derived from gneiss and granite. Slopes range from 45 to 70 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Lakehelen very gravelly fine sandy loam, in an area of Lakehelen-Rock outcrop complex, 45 to 80 percent slopes; about 1,800 feet south and 1,900 feet east of the northwest corner of sec. 9, T. 17 S., R. 69 W.

Oi—3 to 2 inches; fir litter.

Oa—2 inches to 0; decomposed fir litter.

E1—0 to 5 inches; pale brown (10YR 6/3) very gravelly fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 35 percent gravel, 15 percent cobbles, and 10 percent stones; neutral; abrupt smooth boundary.

E2—5 to 15 inches; light brown (7.5YR 6/3) extremely gravelly sandy loam, dark brown (7.5YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 50 percent gravel and 15 percent cobbles; slightly acid; clear smooth boundary.

Bt—15 to 23 inches; light brown (7.5YR 6/4) extremely gravelly loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common thin clay films on faces of peds; about 55 percent gravel and 10 percent cobbles; neutral; clear irregular boundary.

R—23 inches; fractured gneiss bedrock.

The depth to bedrock and the thickness of the solum are 20 to 40 inches. The content of rock fragments is 35 to 80 percent. Reaction is slightly acid or neutral throughout the profile.

The Bt horizon is extremely gravelly loam, extremely gravelly clay loam, or extremely gravelly sandy clay loam.

Larand Series

The Larand series consists of deep, well drained soils on mountainsides and on a moraine. These soils formed in colluvium, glacial outwash, and till. Slopes range from 10 to 40 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 42 degrees F. The soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Larand very gravelly fine sandy loam, 10 to 40 percent slopes, near the center of sec. 9, T. 50 N., R. 12 E.

Oa—1 inch to 0; well decomposed organic matter.

E—0 to 9 inches; light brown (7.5YR 6/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel, 5 percent cobbles, and 1 percent stones; moderately acid; clear wavy boundary.

E/Bt—9 to 15 inches; pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; about 35 percent gravel and 10 percent cobbles; moderately acid; clear wavy boundary.

Bt/E—15 to 22 inches; pink (7.5YR 7/4) very cobbly sandy clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; few thin clay films on faces of peds in the Bt part; about 30 percent gravel and 20 percent cobbles; moderately acid; gradual wavy boundary.

C1—22 to 28 inches; pink (7.5YR 7.4) extremely cobbly sandy clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; about 30 percent gravel and 50 percent cobbles; moderately acid; clear wavy boundary.

2C2—28 to 60 inches; pink (7.5YR 7/4) extremely cobbly loamy sand, brown (7.5YR 5/4) moist; single grain; loose, nonsticky and nonplastic; about 30 percent gravel, 50 percent cobbles, and 10 percent stones; moderately acid.

The content of rock fragments is 35 to 80 percent in the control section. The depth to the sandy-skeletal 2C horizon ranges from 24 to 50 inches. Reaction in the E, E/Bt, Bt/E, and C horizons is moderately acid to neutral. Some pedons have an A horizon about 2 inches thick.

The E horizon has hue of 7.5YR or 10YR. The E and E/Bt horizons are very gravelly sandy loam, very gravelly fine sandy loam, or extremely gravelly sandy loam. The Bt/E horizon is very cobbly sandy clay loam, very gravelly sandy clay loam, or extremely gravelly sandy clay loam. The 2C horizon has hue of 7.5YR or 10YR. It is extremely gravelly loamy sand or extremely cobbly loamy sand. The texture of the fine-earth fraction is sand.

Larkson Series

The Larkson series consists of deep, well drained soils on fan terraces and foot slopes below escarpments. These soils formed in alluvium and colluvium. Slopes range from 5 to 40 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are fine, montmorillonitic Typic Eutroboralfs.

Typical pedon of Larkson stony loam, 5 to 20 percent slopes, about 1,000 feet east of the southwest corner of sec. 25, T. 20 S., R. 70 W.

Oi—2 inches to 0; ponderosa pine and Gambel oak litter.

A—0 to 3 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, sticky and nonplastic; about 10 percent gravel, 5 percent cobbles, and 6 percent stones; neutral; abrupt smooth boundary.

E—3 to 8 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, sticky and nonplastic; about 15 percent gravel, 10 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

Bt1—8 to 25 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium angular blocky structure; very hard, firm, very sticky and plastic; many thick clay films on faces of peds and lining pores; about 5 percent gravel; neutral; clear smooth boundary.

Bt2—25 to 40 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; about 5 percent gravel; common moderately thick clay films on faces of peds; neutral; gradual wavy boundary.

C—40 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and nonplastic; neutral.

Hue is 10YR or 7.5YR throughout the profile. The base of the argillic horizon is at a depth of 20 to more than 60 inches. The content of rock fragments is 0 to 35 percent.

The Bt horizon is clay loam, silty clay loam, or clay. The C horizon is loam, silt loam, or clay loam.

Libeg Series

The Libeg series consists of deep, well drained soils on fan terraces. These soils formed in glacial outwash. Slopes range from 10 to 20 percent. The average annual precipitation is 16 to 18 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Libeg extremely cobbly sandy loam, 10 to 20 percent slopes, about 500 feet west and 450 feet north of the southeast corner of sec. 5, T. 46 N., R. 12 E.

A—0 to 7 inches; dark brown (7.5YR 4/2) extremely cobbly sandy loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel, 40 percent cobbles, and 10 percent stones; neutral; abrupt smooth boundary.

BA—7 to 11 inches; brown (7.5YR 5/2) extremely cobbly sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, nonsticky and nonplastic; about 30 percent gravel, 40 percent cobbles, and 10 percent stones; neutral; abrupt smooth boundary.

Bt—11 to 25 inches; brown (7.5YR 5/4) extremely cobbly sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few thin clay films on faces of peds; about 40 percent gravel, 25 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

BC—25 to 36 inches; brown (7.5YR 5/4) extremely cobbly sandy loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; about 40 percent gravel, 25 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

C1—36 to 42 inches; brown (7.5YR 5/4) extremely cobbly sandy loam, dark brown (7.5YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 25 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

C2—42 to 60 inches; brown (7.5YR 5/4) extremely cobbly sandy loam, brown or dark brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; about 40 percent gravel, 25 percent cobbles, and 5 percent stones; neutral.

The mollic epipedon is 10 to 14 inches thick. The solum is 30 to 50 inches thick. The content of rock fragments is 60 to 85 percent in the control section. Hue is 7.5YR or 10YR throughout the profile.

The Bt horizon is extremely gravelly sandy clay loam or extremely cobbly sandy clay loam. The C horizon is extremely gravelly sandy loam or extremely cobbly sandy loam. Some pedons do not have a C horizon within a depth of 60 inches.

Limon Series

The Limon series consists of deep, well drained soils on foot slopes, fans, and stream terraces. These soils formed in clayey alluvium. Slopes range from 0 to 12 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 51 to 53 degrees F. The soils are fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents.

Typical pedon of Limon silty clay loam, in an area of Limon-Gaynor silty clay loams, 0 to 3 percent slopes; about 1,300 feet south and 1,600 feet east of the northwest corner of sec. 36, T. 18 S., R. 70 W.

A—0 to 3 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, firm, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—3 to 11 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; weak medium angular blocky structure; extremely hard, firm, very sticky and very plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

C—11 to 46 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent; moderately alkaline.

Cr—46 inches; fractured, calcareous shale.

Hue is 2.5Y or 10YR throughout the profile.

The A horizon is mildly alkaline or moderately alkaline. The C horizon is silty clay loam, silty clay, or clay.

The Limon soil in map units 59, 60, and 63 has a seasonal high water table because of seep generated by irrigation canals. The Limon soil in map unit 58 is slightly saline or moderately saline. The Limon soil in map units 58, 59, 60, and 63 has shale to a depth of more than 60 inches.

Louviers Series

The Louviers series consists of shallow, well drained soils on canyonsides, hills, ridges, and hogbacks. These soils formed in residuum derived from shale and siltstone. Slopes range from 20 to 50 percent. The average annual precipitation is 13 to 15 inches, and the mean annual air temperature is 48 to 50 degrees F. The soils are clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents.

Typical pedon of Louviers very channery clay loam, in an area of Louviers-Travessilla complex, 20 to 50 percent slopes; about 500 feet north and 800 feet east of the southwest corner of sec. 29, T. 18 S., R. 71 W.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) very channery clay loam, grayish brown (2.5Y 5/2) moist; weak very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; about 55 percent channers; neutral; abrupt smooth boundary.

AC—3 to 6 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; very hard, friable, very sticky and very plastic; mildly alkaline; abrupt smooth boundary.

C—6 to 16 inches; gray or light gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; neutral; clear smooth boundary.

Cr—16 inches; clayey shale.

The depth to paralithic contact ranges from 10 to 20 inches. Reaction is slightly acid to mildly alkaline throughout the profile. Hue is 10YR to 5Y.

Manvel Series

The Manvel series consists of deep, well drained soils on plains, foot slopes, fans, stream terraces, and swales. These soils formed in alluvium derived from limestone and shale. Slopes range from 0 to 8 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 51 to 53 degrees F. The soils are fine-silty, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Manvel silt loam, 3 to 8 percent slopes, about 200 feet south and 1,800 feet west of the northeast corner of sec. 28, T. 18 S., R. 68 W.

A—0 to 6 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

AC—6 to 13 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—13 to 27 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—27 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and plastic; strongly effervescent; moderately alkaline.

Typically, these soils are calcareous at the surface, but in some pedons they are leached to a depth of 1 to 6 inches. The content of rock fragments is 0 to 10 percent.

The A horizon is silt loam or silty clay loam. The C horizon is silt loam, silty clay loam, or loam.

Manzanola Series

The Manzanola series consists of deep, well drained soils on fans and plains. These soils formed in alluvium. Slopes range from 1 to 5 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 47 to 53 degrees F. The soils are fine, montmorillonitic, mesic Ustollic Haplargids.

Typical pedon of Manzanola loam, 1 to 5 percent slopes, about 1,300 feet west and 2,600 feet south of the northeast corner of sec. 28, T. 18 S., R. 69 W.

A—0 to 4 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

Bt—4 to 9 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common thin clay films on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk—9 to 17 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few thin clay films on faces of peds; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—17 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; hard, firm, very sticky and plastic; common medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—30 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, very sticky and plastic; about 10 percent shale fragments; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The depth to continuous subhorizons of visible secondary calcium carbonate ranges from 10 to 20 inches. The base of the argillic horizon is at a depth of 11 to 30 inches. The content of rock fragments is 0 to 15 percent.

The A horizon is mildly alkaline or moderately alkaline. The B horizon is silty clay, silty clay loam, clay loam, or clay. The Bk horizon is silty clay loam, clay loam, or loam.

Martinsdale Series

The Martinsdale series consists of deep, well drained soils on fans and foot slopes of intermontane basins. These soils formed in mixed alluvium. Slopes range from 3 to 12 percent. The average annual precipitation is 13 to 16 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Martinsdale sandy loam, 3 to 12 percent slopes, about 85 feet north and 1,300 feet east of the southwest corner of sec. 36, T. 20 S., R. 73 W.

A—0 to 5 inches; dark brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 5 percent gravel; neutral; clear smooth boundary.

Bt—5 to 11 inches; dark brown (10YR 4/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

Btk—11 to 15 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 10 percent gravel; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—15 to 21 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; about 10 percent gravel; common medium soft masses of calcium carbonate; moderately alkaline; strongly effervescent; clear wavy boundary.

Bk2—21 to 45 inches; very pale brown (10YR 7/3) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; about 10 percent gravel; violently effervescent; moderately alkaline; about 25 percent calcium carbonate; gradual wavy boundary.

C—45 to 60 inches; pale brown (10YR 6/3) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 15 percent gravel; violently effervescent; moderately alkaline.

The mollic epipedon is 8 to 15 inches thick. The depth to consistent horizons of secondary calcium carbonate is 11 to 30 inches. The content of rock fragments above a depth of 40 inches is 0 to 15 percent.

The Bt horizon is sandy clay loam or clay loam. It is neutral or mildly alkaline. The Bk and C horizons are sandy loam, loam, sandy clay loam, or gravelly sandy loam.

Martinsdale Variant

The Martinsdale Variant consists of deep, well drained soils on the lower end of fan terraces. These soils formed in alluvium. Slopes range from 2 to 5 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are fine-loamy, mixed Pachic Argiborolls.

Typical pedon of Martinsdale Variant sandy loam, 2 to 5 percent slopes, about 400 feet north and 400 feet east of the southwest corner of sec. 35, T. 47 N., R. 12 E.

A1—0 to 5 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; about 5 percent gravel; neutral; abrupt smooth boundary.

A2—5 to 16 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 5 percent gravel; neutral; abrupt smooth boundary.

BA—16 to 21 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; about 5 percent gravel; neutral; abrupt smooth boundary.

Bt—21 to 33 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds and lining pores; about 5 percent gravel; mildly alkaline; clear smooth boundary.

Bk1—33 to 43 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—43 to 60 inches; light reddish brown (5YR 6/3) sandy loam, reddish brown (5YR 4/3) moist; few fine faint reddish yellow (7.5YR 6/8) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; about 10 percent gravel; weak fine and medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The mollic epipedon is 16 to 30 inches thick. The depth to visible accumulations of secondary calcium carbonate is 17 to 30 inches. Hue is 10YR or 7.5YR throughout the profile.

The A horizon has hue of 10YR or 7.5YR. The Bt horizon is neutral or mildly alkaline. It is loam, clay loam, or sandy clay loam. The Bk horizon is loam, sandy loam, or clay loam. It is mildly alkaline or moderately alkaline.

The Martinsdale Variant in Fremont County has a mollic epipedon about 16 to 30 inches thick, which is outside the range for the Martinsdale series.

Midway Series

The Midway series consists of shallow, well drained soils on ridges, knobs, and knolls on the plains and on hills and steep edges of old terraces. These soils formed in residuum derived from clayey shale. Slopes range from 3 to 40 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents.

Typical pedon of Midway clay loam, 3 to 15 percent slopes, about 200 feet west and 2,800 feet north of the southeast corner of sec. 22, T. 18 S., R. 70 W.

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; moderate very fine granular structure; soft, very friable, sticky and plastic; many very fine roots; violently effervescent; moderately alkaline; clear smooth boundary.

C1—3 to 9 inches; light yellowish brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; massive; extremely hard, friable, sticky and plastic; common very fine roots; about 10 percent fine shale fragments; violently effervescent; moderately alkaline; clear smooth boundary.

C2—9 to 16 inches; light yellowish brown (2.5Y 6/4) extremely shaly clay, olive brown (2.5Y 4/4) moist; massive; extremely hard, friable, sticky and plastic; common very fine roots; about 80 percent fine shale

Figure 8.—A typical profile of Minnequa silt loam. This soil formed in material derived from limestone and shale.

fragments; violently effervescent; moderately alkaline; abrupt smooth boundary.

Cr—16 inches; highly fractured clay shale; few roots in fractures in the upper part; violently effervescent.

The depth to shale ranges from about 6 to 20 inches. The soils are commonly calcareous throughout, but in some pedons they are leached to a depth of 2 to 3 inches. Hue is 5Y to 10YR throughout the profile.

The A horizon is clay loam or very gravelly clay loam. The C horizon is clay or silty clay. It has as much as 80 percent unstable shale chips above the bedrock.

Minnequa Series

The Minnequa series consists of moderately deep, well drained soils on plains, breaks, and ridges. These soils formed in alluvium and residuum derived from limestone and shale. Slopes range from 2 to 15 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are fine-silty, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Minnequa silt loam (fig. 8), in an area of Penrose-Minnequa complex, 2 to 25 percent slopes; about 1,750 feet east and 2,100 feet north of the southwest corner of sec. 11, T. 20 S., R. 68 W., about 200 feet east of a canal:

A—0 to 2 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—2 to 5 inches; pale brown (10YR 6/3) silty clay loam, brown or dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—5 to 9 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

C—9 to 28 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; moderately alkaline; strongly effervescent; clear smooth boundary.

Cr—28 inches; slightly hard, fractured limestone.

The depth to lithic contact ranges from 20 to 40 inches. In some places the soil is underlain by hard bedrock. The content of rock fragments, mainly ¼ inch to 2 inches in diameter, is 0 to 5 percent.

The C horizon is silt loam, loam, or silty clay loam.

Morset Series

The Morset series consists of deep, well drained soils on fans and toe slopes. These soils formed in alluvium. Slopes range from 2 to 8 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 42 to 45 degrees F. The soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Morset loam, 2 to 8 percent slopes, about 100 feet north and 2,600 feet west of the southeast corner of sec. 12, T. 51 N., R. 10 E.

A—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium platy structure; soft, very friable, slightly sticky and nonplastic; about 10 percent gravel; slightly effervescent; mildly alkaline; abrupt smooth boundary.

AB—5 to 8 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak moderate subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; about 5 percent gravel; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bt—8 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 5 percent gravel; slightly effervescent; mildly alkaline; clear smooth boundary.

Btk—15 to 21 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; weak moderate subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few thin clay films on faces of peds; about 5 percent gravel; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—21 to 47 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; about 5 percent gravel; violently effervescent; about 25 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

Bk2—47 to 60 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 10 percent gravel; few fine filaments and soft masses of calcium carbonate; violently effervescent; moderately alkaline.

The mollic epipedon is 7 to 15 inches thick. Depth to the base of the argillic horizon is 15 to 30 inches. Hue is 7.5YR or 10YR throughout the profile. The content of rock fragments is 0 to 35 percent.

The A and B horizons are neutral or mildly alkaline. The Bt and Bk horizons are loam, sandy clay loam, or clay loam.

Mussel Series

The Mussel series consists of deep, well drained soils on terraces, fans, and foot slopes. These soils formed in alluvium. Slopes range from 2 to 10 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 42 to 45 degrees F. The soils are fine-loamy, mixed (calcareous), frigid Ustic Torriorthents.

Typical pedon of Mussel sandy loam, in an area of Mussel-Bronell complex, 2 to 15 percent slopes; approximately at the center of sec. 32, T. 48 N., R. 11 E.

A—0 to 6 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; violently effervescent; moderately alkaline; clear smooth boundary.
AC—6 to 13 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; violently effervescent; moderately alkaline; clear wavy boundary.
C1—13 to 28 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; violently effervescent; moderately alkaline; clear wavy boundary.
2C2—28 to 40 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; violently effervescent; mildly alkaline; gradual irregular boundary.
2C3—40 to 60 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline.

The content of rock fragments, mainly less than 3 inches in diameter, is 0 to 30 percent. The C horizon is sandy loam, fine sandy loam, loam, gravelly sandy loam, or gravelly loam.

Nederland Series

The Nederland series consists of deep, well drained soils on short, steep fan terrace edges. These soils formed in alluvium derived dominantly from granitic and sedimentary rock. Slopes range from 20 to 45 percent. The average annual precipitation is 14 or 15 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are loamy-skeletal, mixed, mesic Aridic Argiustolls.

Typical pedon of Nederland extremely cobbly sandy loam, in an area of Shanta-Nederland association; about 1,700 feet west and 1,100 feet north of the southeast corner of sec. 35, T. 20 S., R. 69 W.

A—0 to 8 inches; brown (7.5YR 4/2) extremely cobbly sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and plastic; about 35 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; abrupt smooth boundary.
BA—8 to 13 inches; reddish brown (5YR 5/3) extremely cobbly sandy clay loam, dark reddish brown (5YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; about 35 percent gravel, 25 percent cobbles, and 15 percent stones; neutral; clear smooth boundary.
Bt—13 to 22 inches; reddish brown (5YR 5/3) extremely cobbly sandy clay loam, dark reddish brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds and lining pores; about 35 percent gravel, 25 percent cobbles, and 15 percent stones; neutral; clear smooth boundary.
BCt—22 to 31 inches; light reddish brown (5YR 6/4) extremely cobbly sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few moderately thick clay films on faces of peds; about 35 percent gravel, 25 percent cobbles, and 15 percent stones; neutral; gradual wavy boundary.
C—31 to 60 inches; reddish yellow (5YR 6/6) extremely cobbly sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; about 35 percent gravel, 25 percent cobbles, and 15 percent stones; neutral.

The mollic epipedon is 7 to 15 inches thick. The solum is 15 to 35 inches thick. The content of rock fragments is 40 to 75 percent. Reaction is neutral or mildly alkaline throughout the profile.

The B horizon is very cobbly sandy clay loam, very cobbly loam, extremely cobbly sandy clay loam, or extremely cobbly loam. The C horizon is extremely cobbly sandy loam, extremely cobbly coarse sandy loam, very cobbly sandy loam, or very cobbly coarse sandy loam.

Neville Series

The Neville series consists of deep, well drained soils on foot slopes, fans, and fan terraces. These soils formed in alluvium derived dominantly from red sandstone and siltstone. Slopes range from 3 to 10 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 47 to 53 degrees F. The soils are fine-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Neville fine sandy loam, in an area of Rizozo-Neville complex, 3 to 30 percent slopes; about 1,500 feet north and 1,800 feet west of the southeast corner of sec. 31, T. 17 S., R. 72 W.

A—0 to 3 inches; yellowish red (5YR 5/6) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; mildly alkaline; clear smooth boundary.

AC—3 to 15 inches; yellowish red (5YR 5/6) loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

C—15 to 60 inches; yellowish red (5YR 5/6) loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

The content of rock fragments is 0 to 15 percent. Hue is 2.5YR or 5YR throughout the profile.

The C horizon is fine sandy loam, loam, sandy loam, or sandy clay loam.

Nunn Series

The Nunn series consists of deep, well drained soils on fans, fan terraces, and foot slopes. These soils formed in loess and alluvium. Slopes range from 0 to 8 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 47 to 53 degrees F. The soils are fine, montmorillonitic, mesic Aridic Argiustolls.

Typical pedon of Nunn clay loam, 0 to 2 percent slopes, about 200 feet west and 200 feet south of the northeast corner of sec. 36, T. 20 S., R. 69 W.

Ap1—0 to 4 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, sticky and plastic; neutral; abrupt smooth boundary.

Ap2—4 to 10 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, very sticky and plastic; neutral; clear smooth boundary.

Bt—10 to 28 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many moderately thick clay films on faces of peds; neutral; clear smooth boundary.

Btk—28 to 35 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and plastic; few moderately thick clay films on faces of peds; neutral; few fine soft masses of calcium carbonate; slightly effervescent; gradual smooth boundary.

Bk—35 to 60 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; common medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 15 inches thick. The depth to secondary calcium carbonate is 10 to 25 inches. Depth to the base of the argillic horizon is 20 to 40 inches. The content of rock fragments is 0 to 15 percent. Hue is 7.5YR or 10YR throughout the profile.

The A horizon is clay loam, loam, or stony loam. It is neutral or mildly alkaline. The Bt horizon is clay loam, silty clay loam, or clay. It is neutral to moderately alkaline. The Bk horizon is silt loam, clay loam, or loam. It is mildly alkaline or moderately alkaline.

Otero Series

The Otero series consists of deep, well drained soils on side slopes and fans. These soils formed in eolian sand and alluvium. Slopes range from 3 to 8 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 49 to 53 degrees F. The soils are coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Otero loamy fine sand, 3 to 8 percent slopes, about 1,800 feet south and 850 feet west of the northeast corner of sec. 24, T. 19 S., R. 69 W.

A—0 to 3 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—3 to 10 inches; very pale brown (10YR 7/4) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline; clear smooth boundary.

C—10 to 60 inches; very pale brown (10YR 7/4) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine soft masses of inconsistently visible secondary calcium carbonate; strongly effervescent; moderately alkaline.

These soils are typically calcareous throughout the profile, but in some pedons they are noncalcareous to a depth of 1 to 10 inches. Hue is 10YR or 7.5YR throughout the profile. The content of rock fragments is 0 to 15 percent. Reaction is mildly alkaline or moderately alkaline.

The A horizon is loamy fine sand or fine sandy loam. The C horizon is sandy loam or fine sandy loam.

Pendant Series

The Pendant series consists of shallow, well drained or somewhat excessively drained soils on hilly pediments and cuestas. These soils formed in residuum derived dominantly from limestone. Slopes range from 10 to 40 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 44 to 46 degrees F. The soils are loamy-skeletal, mixed Lithic Haploborolls. Typically, the surface is covered with 1 to 3 percent stones.

Typical pedon of Pendant extremely gravelly loam, 10 to 40 percent slopes, very stony, about 2,150 feet south and 200 feet east of the northwest corner of sec. 21, T. 16 S., R. 70 W.

A1—0 to 4 inches; brown (7.5YR 4/2) extremely gravelly loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel, 20 percent cobbles, and 10 percent stones; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—4 to 11 inches; brown (7.5YR 4/2) extremely gravelly loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 45 percent gravel and 20 percent cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—11 inches; hard, fractured limestone bedrock.

The depth to bedrock is 7 to 20 inches. The mollic epipedon is 5 to 12 inches thick. The content of rock fragments is 40 to 80 percent. Reaction is mildly alkaline or moderately alkaline throughout the profile. Hue is 2.5Y to 7.5YR.

Penrose Series

The Penrose series consists of shallow, well drained soils on breaks, ridges, plains, hogbacks, and canyonsides. These soils formed in residuum derived from limestone. Slopes range from 2 to 40 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are loamy, carbonatic, mesic Lithic Ustic Torriorthents.

Typical pedon of Penrose channery loam, in an area of Penrose-Rock outcrop complex, 25 to 40 percent slopes; about 1,100 feet north and 1,600 feet west of the southeast corner of sec. 21, T. 18 S., R. 68 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) channery loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 25 percent channers; violently effervescent; moderately alkaline; clear smooth boundary.

C—4 to 15 inches; light gray (2.5Y 7/2) channery loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; about 20 percent limestone channers; violently effervescent; moderately alkaline; abrupt smooth boundary.

R—15 inches; limestone bedrock.

The depth to lithic contact is 10 to 20 inches. The content of rock fragments is 0 to 35 percent.

The A horizon is mildly alkaline or moderately alkaline. The C horizon is channery silt loam, channery clay loam, channery loam, loam, or silt loam.

Querida Series

The Querida series consists of deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slopes range from 2 to 8 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 42 to 45 degrees F. The soils are coarse-loamy, mixed (calcareous), frigid Ustic Torriorthents.

Typical pedon of Querida gravelly sandy loam, 2 to 8 percent slopes, in an unsectionalized area about 3,000 feet south and 500 feet west of the southeast corner of sec. 35, T. 49 N., R. 10 E., or about 100 feet north of a county road and about 1,300 feet southeast of the Howard dump in sec. 2, T. 48 N., R. 10 E.

A1—0 to 2 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel; mildly alkaline; slightly effervescent; abrupt smooth boundary.

A2—2 to 11 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel; moderately alkaline; slightly effervescent; abrupt smooth boundary.

C—11 to 60 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; about 30 percent gravel; moderately alkaline; strongly effervescent.

The content of rock fragments is 0 to 30 percent. Calcareous material is at a depth of 0 to 20 inches.

The C horizon is fine sandy loam, sandy loam, gravelly sandy loam, or gravelly loamy sand. It has hue of 7.5YR or 10YR.

Raleigh Series

The Raleigh series consists of shallow, somewhat excessively drained soils on mountainsides. These soils formed in residuum derived from granitic rock. Slopes range from 15 to 40 percent. The average annual precipitation is 16 to 18 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed, shallow Typic Cryoborolls.

Typical pedon of Raleigh very gravelly sandy loam, in an area of Raleigh-Rock outcrop complex, 15 to 40 percent slopes; about 2,200 feet north and 1,200 feet west of the southeast corner of sec. 17, T. 49 N., R. 11 E.

A—0 to 2 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; about 50 percent gravel and 2 percent stones; slightly acid; abrupt smooth boundary.

Bw—2 to 6 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 55 percent gravel; neutral; clear wavy boundary.

BC—6 to 13 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 55 percent gravel; neutral; clear smooth boundary.

C—13 to 18 inches; yellowish brown (10YR 5/6) extremely gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; massive; loose, nonsticky and nonplastic; about 80 percent gravel; neutral; gradual wavy boundary.

Cr—18 to 60 inches; brownish yellow granodiorite (grus).

The depth to weathered granodiorite ranges from 10 to 20 inches. The content of rock fragments, mainly angular pebbles (grus), ranges from 35 to 55 percent in the A horizon and from 40 to 80 percent below the A horizon. Reaction is slightly acid or neutral throughout the profile. After mixing, the mollic epipedon is 7 inches thick or more. Hue is 10YR or 7.5YR throughout the profile.

The B horizon is very gravelly sandy loam or very gravelly coarse sandy loam. The C horizon is extremely gravelly loamy sand, extremely gravelly sandy loam, or extremely gravelly loamy coarse sand.

Redcameron Series

The Redcameron series consists of shallow, well drained soils on west-facing side slopes of hogbacks. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes range from 20 to 45 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy, mixed (calcareous), frigid Lithic Ustic Torriorthents.

Typical pedon of Redcameron channery loam, in an area of Redcameron-Rock outcrop-Teaspoon complex, 20 to 70 percent slopes; about 900 feet north and 2,200 feet west of the southeast corner of sec. 14, T. 49 N., R. 10 E.

A—0 to 2 inches; pinkish gray (7.5YR 6/2) channery loam, dark brown (7.5YR 3.5/2) moist; weak thick platy structure; soft, very friable, slightly sticky and nonplastic; about 25 percent channers; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—2 to 12 inches; pinkish gray (7.5YR 6/2) channery very fine sandy loam, brown (7.5YR 4/2) moist; massive; soft, very friable, slightly sticky and nonplastic; about 20 percent channers; violently effervescent; moderately alkaline; abrupt smooth boundary.

R—12 inches; hard, red sandstone bedrock.

The depth to bedrock ranges from 4 to 20 inches. The content of sandstone channers is 0 to 35 percent in the control section. Hue is 5YR to 10YR throughout the profile.

The A horizon is mildly alkaline or moderately alkaline. The C horizon is very fine sandy loam, fine sandy loam, channery very fine sandy loam, channery fine sandy loam, or channery loam.

Rentsac Series

The Rentsac series consists of shallow, well drained soils on mountainsides. These soils formed in residuum derived from limestone, siltstone, and sandstone. Slopes range from 20 to 55 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed (calcareous), frigid Lithic Ustic Torriorthents.

Typical pedon of Rentsac very channery loam, 20 to 55 percent slopes, about 2,650 feet north and 250 feet east of the southwest corner of sec. 25, T. 49 N., R. 10 E.

A—0 to 3 inches; grayish brown (10YR 5/2) very channery loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; about 40 percent channers; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—3 to 10 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 55 percent channers; violently effervescent; moderately alkaline; clear irregular boundary.

R—10 inches; hard limestone bedrock.

The content of rock fragments, mainly small channers and angular pebbles, is 35 to 70 percent. The depth to bedrock is 4 to 20 inches. Hue is 2.5Y to 7.5YR throughout the profile.

The A horizon is very channery loam or very gravelly sandy loam. The C horizon is very channery loam or extremely channery loam.

Rentsac Variant

The Rentsac Variant consists of shallow, well drained soils on hills. These soils formed in colluvium and residuum derived from limestone. Slopes range from 5 to 25 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Lithic Cryoborolls.

Typical pedon of Rentsac Variant channery loam, 5 to 25 percent slopes, about 1,050 feet south and 1,450 feet west of the northeast corner of sec. 20, T. 51 N., R. 75 W.

A—0 to 4 inches; brown (10YR 5/3) channery loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 15 percent channers; violently effervescent; moderately alkaline; abrupt smooth boundary.

AC—4 to 7 inches; brown (10YR 5/3) channery loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; about 20 percent channers and 5 percent flagstones; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—7 to 19 inches; very pale brown (10YR 7/4) very channery loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; about 35 percent channers and 10 percent flagstones; violently effervescent; moderately alkaline; gradual wavy boundary.

R—19 inches; hard, fractured limestone bedrock.

The mollic epipedon is 7 to 10 inches thick. The depth to bedrock is 10 to 20 inches. The content of rock fragments is 35 to 60 percent in the control section. Hue is 7.5YR or 10YR throughout the profile.

The Rentsac Variant in Fremont County has a cryic temperature regime and a fine-silty particle-size control section, which are outside the range for the Rentsac series.

Resort Series

The Resort series consists of shallow, somewhat excessively drained soils on mountainsides. These soils formed in residuum derived from granodiorite. Slopes range from 20 to 60 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are sandy-skeletal, mixed, shallow Entic Haploborolls.

Typical pedon of Resort very gravelly sandy loam, 20 to 45 percent slopes, about 1,100 feet south and 1,300 feet west of the northeast corner of sec. 17, T. 49 N., R. 11 E.

A—0 to 8 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; about 40 percent gravel, 5 percent cobbles, and 3 percent stones; neutral; clear smooth boundary.

Bw—8 to 12 inches; brown (10YR 4/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; about 50 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

C—12 to 17 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; about 70 percent gravel and 1 percent cobbles; neutral; abrupt wavy boundary.

Cr—17 to 60 inches; weathered granodiorite (grus).

The depth to bedrock ranges from 10 to 20 inches. The content of angular rock fragments, mainly ⅛ to ½ inch in diameter, is 35 to 80 percent. The mollic epipedon is 7 to 12 inches thick. Reaction is slightly acid or neutral throughout the profile. Hue is 7.5YR or 10YR.

Rizozo Series

The Rizozo series consists of shallow, well drained soils on mountainsides, cuestas, pediments, fan terraces, and fans. These soils formed in residuum derived from red sandstone. Slopes range from 10 to 30 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents.

Typical pedon of Rizozo channery loam, in an area of Rizozo-Rock outcrop complex, 15 to 45 percent slopes; about 500 feet south and 2,200 feet east of the northwest corner of sec. 8, T. 18 S., R. 69 W.

A—0 to 3 inches; weak red (10R 5/4) channery loam, weak red (10R 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 15 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C—3 to 13 inches; pale red (10R 6/4) loam, red (10R 5/6) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; about 10 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—13 inches; hard, pale red sandstone bedrock.

The depth to bedrock is 4 to 20 inches. The content of rock fragments is 10 to 35 percent. Hue is 10R to 5YR throughout the profile. Reaction is mildly alkaline or moderately alkaline.

The C horizon is loam, channery loam, or silt loam.

Rogert Series

The Rogert series consists of shallow, well drained soils on mountainsides, ridges, and hills. These soils formed in residuum derived from granodiorite, gneiss, granite, or sandstone. Slopes range from 5 to 40 percent. The average annual precipitation is 16 to 18 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Lithic Cryoborolls.

Typical pedon of Rogert very gravelly sandy loam, warm, 15 to 40 percent slopes, about 1,150 feet south and 1,300 feet west of the northeast corner of sec. 21, T. 16 S., R. 69 W.

A—0 to 5 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel; neutral; abrupt smooth boundary.

C—5 to 17 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 65 percent gravel; neutral; gradual smooth boundary.

R—17 inches; fractured granodiorite bedrock.

The depth to bedrock is 10 to 20 inches. The mollic epipedon is 7 to 18 inches thick. The content of rock fragments is 35 to 80 percent. Hue is 10YR or 7.5YR throughout the profile. Reaction is slightly acid or neutral.

The C horizon is very gravelly sandy loam, extremely gravelly sandy loam, or extremely gravelly coarse sandy loam.

Roygorge Series

The Roygorge series consists of shallow, well drained soils on mountainsides. These soils formed in residuum derived from gneiss and granite. Slopes range from 25 to 50 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 47 to 52 degrees F. The soils are loamy-skeletal, mixed, mesic Lithic Ustollic Haplargids.

Typical pedon of Roygorge very gravelly sandy clay loam, 25 to 50 percent slopes, about 800 feet north and 2,300 feet east of the southwest corner of sec. 35, T. 18 S., R. 71 W.

Oe—1 inch to 0; partially decomposed pinyon and juniper litter.

A—0 to 2 inches; brown (7.5YR 4/2) very gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; about 35 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.

Bt1—2 to 5 inches; brown (7.5YR 4/4) very gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and slightly plastic; many moderately thick clay films on rock fragments and few on faces of peds; about 45 percent gravel and 10 percent cobbles; neutral; gradual irregular boundary.

Bt2—5 to 11 inches; strong brown (7.5YR 4/6) very gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few thin clay films on faces of peds and on rock fragments; about 45 percent gravel and 10 percent cobbles; neutral; clear irregular boundary.

Bkm—11 to 12 inches; indurated calcium carbonate.

R—12 inches; fractured gneiss bedrock.

The depth to bedrock and to the base of the argillic horizon is 8 to 20 inches. The content of rock fragments is 35 to 75 percent. Reaction is slightly acid to mildly alkaline throughout the profile.

The A horizon has hue of 10YR or 7.5YR. The Bt horizon has hue of 10YR to 5YR. It is very gravelly sandy clay loam, extremely gravelly clay loam, or extremely gravelly sandy clay loam.

Sawfork Series

The Sawfork series consists of deep, well drained soils on the side slopes of dissected fan terraces. These soils formed in colluvium and residuum derived from tuff and ash flow. Slopes range from 8 to 40 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Sawfork very cobbly loam, 8 to 40 percent slopes, about 1,150 feet east and 550 feet south of the northwest corner of sec. 5, T. 51 N., R. 11 E.

A—0 to 4 inches; grayish brown (10YR 5/2) very cobbly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; abrupt smooth boundary.

AB—4 to 8 inches; grayish brown (10YR 5/2) very cobbly loam, dark grayish brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; abrupt wavy boundary.

Bt—8 to 14 inches; pale brown (10YR 6/3) very cobbly clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 30 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear wavy boundary.

BC—14 to 22 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 10 percent gravel; mildly alkaline; gradual wavy boundary.

2C1—22 to 30 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; about 10 percent angular pebble-sized fragments of highly compacted ash that are breakable in the hand; slightly effervescent; moderately alkaline; clear wavy boundary.

2C2—30 to 39 inches; white (10YR 8/1) loam, light brownish gray (10YR 6/2) moist; massive; hard, friable, slightly sticky and slightly plastic; about 60 percent angular pebble-sized fragments of ash that are breakable in the hand; slightly effervescent; moderately alkaline; clear wavy boundary.

2C3—39 to 48 inches; white (10YR 8/1) sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; about 75 percent angular pebbles of tuff that break easily in the hand; slightly effervescent; moderately alkaline; clear wavy boundary.

2Cr—48 inches; highly compacted ash flow tuff; few roots along fractures.

Paralithic contact is at a depth of 40 to 60 inches. The depth to calcareous material ranges from 5 to 25 inches. The mollic epipedon is 7 to 13 inches thick. Depth to the base of the argillic horizon is 10 to 20 inches. The content of rock fragments is 35 to 60 percent in the control section.

The A horizon is neutral or mildly alkaline. The Bt horizon is very cobbly clay loam, very gravelly sandy clay loam, or very gravelly clay loam. It is neutral or mildly alkaline and has hue of 7.5YR or 10YR. The 2C horizon is loam, sandy loam, gravelly loam, or gravelly sandy loam. It has 0 to 35 percent rock fragments and 0 to 75 percent soft fragments of weathered ash flow and tuff. The 2C horizon has hue of 10YR to 5Y. It is mildly alkaline or moderately alkaline.

Sedillo Series

The Sedillo series consists of deep, well drained soils on fan terraces, fan terrace edges, and hills. These soils formed in gravelly and cobbly alluvium. In several areas they formed in landslide deposits. Slopes range from 1 to 40 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 48 to 52 degrees F. The soils are loamy-skeletal, mixed, mesic Ustollic Haplargids.

Typical pedon of Sedillo extremely cobbly loam, in an area of Ustic Torriorthents-Sedillo complex, 15 to 40 percent slopes; about 2,000 feet south and 2,500 feet east of the northwest corner of sec. 21, T. 19 S., R. 70 W.

A—0 to 4 inches; dark brown (10YR 4/3) extremely cobbly loam, dark brown (10YR 3/3) moist; weak thin platy structure; slightly hard, very friable, nonsticky and nonplastic; about 35 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

Bt—4 to 10 inches; yellowish brown (10YR 5/4) extremely cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds; about 35 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear wavy boundary.

Bk1—10 to 16 inches; very pale brown (10YR 7/3) extremely stony sandy clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; about 20 percent gravel, 20 percent cobbles, and 35 percent stones; violently effervescent; about 30 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 35 inches; pale brown (10YR 6/3) extremely stony loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; about 20 percent gravel, 20 percent cobbles, and 35 percent stones; violently effervescent; about 25 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

2Bk3—35 to 42 inches; white (10YR 8/2) loam, very pale brown (10YR 7/3) moist; massive; slightly hard, friable, sticky and slightly plastic; about 5 percent gravel; violently effervescent; about 30 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

2C—42 to 60 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and slightly plastic; about 5 percent gravel; strongly effervescent; mildly alkaline.

The A horizon is neutral or mildly alkaline. It has hue of 10YR or 7.5YR. It is very gravelly loam, extremely cobbly loam, or cobbly sandy loam. The content of rock fragments is 40 to 55 percent in the A horizon.

The Bt horizon is very gravelly loam, very gravelly clay loam, very gravelly sandy clay loam, very cobbly clay loam, or extremely cobbly sandy clay loam. It is neutral to moderately alkaline and has hue of 5YR to 10YR. The content of rock fragments is 40 to 55 percent in the Bt horizon.

The Bk horizon is extremely stony loam, extremely stony sandy clay loam, very cobbly sandy loam, very gravelly sandy loam, very cobbly loam, or loam. The calcium carbonate equivalent is 15 to 30 percent.

The 2Bk and 2C horizons, if they occur, are loam, sandy loam, gravelly sandy loam, or gravelly loam. These horizons contain about 5 to 35 percent rock fragments.

Seitz Series

The Seitz series consists of deep, well drained soils on north-facing mountainsides. These soils formed in alluvium and colluvium. Slopes range from 15 to 45 percent. The average annual precipitation is 15 to 25 inches, and the average annual air temperature is 38 to 44 degrees F. The soils are clayey-skeletal, montmorillonitic Typic Cryoboralfs.

Typical pedon of Seitz gravelly fine sandy loam, 20 to 40 percent slopes, along a trail about 900 feet north and 400 feet east of the southwest corner of sec. 35, T. 51 N., R. 12 E.

Oe—2 inches to 0; partially decomposed needles and twigs.

E—0 to 8 inches; pinkish gray (7.5YR 6/2) gravelly fine sandy loam, brown (7.5YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; about 30 percent gravel; neutral; clear smooth boundary.

E/B—8 to 15 inches; pinkish gray (7.5YR 6/2) gravelly fine sandy loam, brown (7.5YR 4/2) moist (E); yellowish brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist (B); when mixed, the texture is gravelly sandy clay loam; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds in the B part; about 30 percent gravel; neutral; clear wavy boundary.

Bt1—15 to 24 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, very sticky and plastic; many moderately thick clay films on faces of peds; about 25 percent gravel and 10 percent cobbles; neutral; clear wavy boundary.

Bt2—24 to 34 inches; yellowish brown (10YR 5/4) very cobbly clay, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; very hard, firm, very sticky and plastic; many moderately thick clay films on faces of peds; about 15 percent gravel and 25 percent cobbles; neutral; gradual smooth boundary.

Bt3—34 to 40 inches; brown (7.5YR 5/4) very cobbly sandy clay loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few thin clay films on faces of peds; about 10 percent gravel and 40 percent cobbles; neutral; gradual wavy boundary.

C—40 to 60 inches; pinkish gray (7.5YR 6/2) very gravelly sandy clay loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; about 30 percent gravel and 10 percent cobbles; neutral.

Hue is 7.5YR or 10YR throughout the profile. Reaction is slightly acid or neutral. Depth to the base of the argillic horizon is 20 to 45 inches.

The A horizon has 20 to 50 percent rock fragments.

It is gravelly fine sandy loam or very stony loam. The Bt horizon is very cobbly clay loam, very cobbly clay, very stony clay, very gravelly clay, or very gravelly clay loam. The content of rock fragments in the Bt horizon, on a weighted average basis, is 15 to 30 percent pebbles, 20 to 40 percent cobbles, and 0 to 15 percent stones. Some pedons do not have a C horizon.

Shanta Series

The Shanta series consists of deep, well drained soils on stream terraces. These soils formed in alluvium. Slopes range from 0 to 4 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 48 to 53 degrees F. The soils are fine-loamy, mixed, mesic Cumulic Haplustolls.

Typical pedon of Shanta loam, 0 to 3 percent slopes, about 2,400 feet east and 2,075 feet south of the northwest corner of sec. 9, T. 17 S., R. 70 W.

A1—0 to 2 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—2 to 10 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

A3—10 to 22 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

AB—22 to 49 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—49 to 60 inches; brown (7.5YR 5/4), stratified sandy loam and loamy sand, dark brown (7.5YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Hue is 2.5Y to 7.5YR throughout the profile. The content of rock fragments is 0 to 15 percent in the control section. The texture is sandy loam, fine sandy loam, loam, sandy clay loam, silty clay loam, silt loam, or clay loam. The soils also have strata of loamy sand about 2 to 10 inches thick. Reaction is mildly alkaline or moderately alkaline throughout the profile.

Shingle Series

The Shingle series consists of shallow, well drained soils on plains, breaks, and foot slopes and on the side slopes of hilly remnants of fan terraces. These soils formed in residuum derived from interbedded shale and sandstone. Slopes range from 3 to 40 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents.

Typical pedon of Shingle loam, 3 to 20 percent slopes, about 900 feet north and 400 feet east of the southwest corner of sec. 21, T. 19 S., R. 68 W.

A—0 to 3 inches; light gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—3 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, very friable, sticky and plastic; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—6 to 13 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few small shale fragments; violently effervescent; moderately alkaline; abrupt wavy boundary.

Cr—13 inches; weathered, platy shale.

The depth to shale is 4 to 20 inches. Hue is 2.5Y or 10YR throughout the profile. The C horizon is loam, clay loam, or sandy clay loam.

Shrine Series

The Shrine series consists of deep, well drained soils on fan terraces and fans. These soils formed in alluvium. Slopes range from 2 to 8 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are fine-loamy, mixed Torriorthentic Haploborolls.

Typical pedon of Shrine loam, 2 to 8 percent slopes, about 700 feet north and 100 feet west of the southeast corner of sec. 2, T. 48 N., R. 10 E.

Ap—0 to 10 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—10 to 28 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—28 to 60 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Hue is 10YR or 7.5YR throughout the profile. The mollic epipedon is 7 to 15 inches thick.

The Ap horizon is mildly alkaline or moderately alkaline. The content of rock fragments is 0 to 15 percent in the Ap horizon. The C horizon is loam or gravelly loam.

Swissvale Series

The Swissvale series consists of shallow, well drained soils on mountainsides. These soils formed in residuum derived from interbedded sandstone and siltstone. Slopes range from 20 to 55 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Borollic Lithic Haplargids.

Typical pedon of Swissvale very gravelly sandy loam, in an area of Swissvale-Rentsac complex, 20 to 55 percent slopes; about 600 feet east and 2,200 feet north of the southwest corner of sec. 17, T. 49 N., R. 10 E.

A—0 to 2 inches; grayish brown (10YR 5/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 45 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

BA—2 to 5 inches; grayish brown (10YR 5/2) very gravelly sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; about 45 percent gravel and 10 percent cobbles; neutral; clear smooth boundary.

Bt—5 to 9 inches; yellowish brown (10YR 5/4) very gravelly clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; hard, firm, sticky and slightly plastic; common moderately thick clay films on faces of peds and lining interstitial pores; about 45 percent gravel and 10 percent cobbles; mildly alkaline; clear smooth boundary.

Cr—9 to 19 inches; weathered, calcareous siltstone.

R—19 inches; fractured, hard siltstone bedrock.

The depth to hard bedrock ranges from 8 to 20 inches. Reaction is neutral or mildly alkaline throughout the profile. Hue is 2.5Y to 7.5YR. The content of rock fragments is 35 to 55 percent.

The Bt horizon is very gravelly clay loam or very gravelly sandy clay loam.

Teaspoon Series

The Teaspoon series consists of shallow, well drained soils on mountainsides and hogbacks. These soils formed in residuum derived from gneissic metasedimentary rock, gneiss, granite, granodiorite, and sandstone. Slopes range from 15 to 50 percent. The average annual precipitation is 13 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Lithic Argiborolls.

Typical pedon of Teaspoon very gravelly sandy loam, in an area of Casvare-Teaspoon complex, 20 to 50 percent slopes; about 2,400 feet north and 800 feet east of the southwest corner of sec. 30, T. 49 N., R. 11 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; soft, friable, slightly sticky and nonplastic; about 55 percent gravel; neutral; clear smooth boundary.

Bt—3 to 11 inches; brown (10YR 4/3) extremely gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds and on rock fragments; about 75 percent gravel; neutral; gradual wavy boundary.

R—11 inches; hard, fractured gneissic metasedimentary bedrock.

The depth to bedrock and to the base of the argillic horizon is about 10 to 20 inches. Reaction is slightly acid to mildly alkaline. The mollic epipedon is 8 to 12 inches thick. Hue is 5YR to 10YR throughout the profile.

The A horizon is very gravelly sandy loam or very stony sandy loam. The Bt horizon is very gravelly sandy clay loam, very gravelly clay loam, extremely gravelly sandy clay loam, or very channery sandy loam.

Tecolote Series

The Tecolote series consists of deep, well drained soils on short terrace edges along drainageways and on fan terraces and moraines. These soils formed in alluvium and in glacial till and outwash. Slopes range from 15 to 40 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 43 to 46 degrees F. The soils are loamy-skeletal, mixed Typic Eutroboralfs.

Typical pedon of Tecolote very gravelly sandy loam, 15 to 40 percent slopes, about 740 feet north and 1,900 feet west of the southeast corner of sec. 30, T. 20 S., R. 69 W.

Oe—2 inches to 0; ponderosa pine and Gambel oak litter.

A—0 to 3 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 5 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

E—3 to 9 inches; pale brown (10YR 6/3) very gravelly coarse sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 5 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

Bt1—9 to 27 inches; light brown (7.5YR 6/4) extremely gravelly sandy clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and nonplastic; many moderately thick clay films on faces of peds and on rock fragments; about 40 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

Bt2—27 to 41 inches; brown (7.5YR 5/4) extremely gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common moderately thick clay films on faces of peds and on rock fragments; about 40 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

BC—41 to 60 inches; brown (7.5YR 5/4) extremely gravelly coarse sandy loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; about 40 percent gravel, 20 percent cobbles, and 5 percent stones; neutral.

Rock fragments cover 35 to 55 percent of the surface. The content of rock fragments is 40 to 75 percent in the control section.

The A horizon is very cobbly sandy loam or very gravelly sandy loam. The E horizon is very gravelly sandy loam or extremely gravelly sandy loam. The A and E horizons have hue of 10YR or 7.5YR. The Bt horizon is gravelly clay loam, very gravelly clay loam, gravelly sandy clay loam, very gravelly sandy clay loam, extremely gravelly sandy loam, or extremely gravelly sandy clay loam.

Tellura Series

The Tellura series consists of deep, well drained soils on fans and fan terraces. These soils formed in alluvium and residuum derived from breccia. Slopes range from 4 to 25 percent. The average annual precipitation is 18 to 22 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are clayey-skeletal, montmorillonitic Argic Cryoborolls.

Typical pedon of Tellura gravelly clay loam, 4 to 25 percent slopes, about 1,000 feet east and 700 feet north of the southwest corner of sec. 33, T. 51 N., R. 12 E.

A1—0 to 9 inches; very dark gray (10YR 3/1) gravelly clay loam, black (10YR 2/1) moist; moderate very fine granular structure; slightly hard, very friable, sticky and slightly plastic; about 25 percent gravel; slightly acid; abrupt smooth boundary.

A2—9 to 13 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, sticky and slightly plastic; about 25 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—13 to 22 inches; brown (10YR 5/3) very gravelly clay, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 40 percent gravel and 2 percent cobbles; neutral; gradual wavy boundary.

Bt2—22 to 48 inches; brown (10YR 5/3) very gravelly sandy clay, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; very hard, friable, sticky and slightly plastic; common moderately thick clay films on faces of peds; about 40 percent gravel and 5 percent cobbles; neutral; gradual irregular boundary.

C—48 to 60 inches; grayish brown (10YR 5/2) extremely gravelly sandy clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, very friable, sticky and slightly plastic; about 45 percent gravel and 20 percent cobbles; mildly alkaline.

The depth to uniformly calcareous material ranges from 40 to more than 60 inches. The content of rock fragments, mainly gravel and cobbles, ranges from 35 to 85 percent above a depth of 50 inches in the Bt and C horizons. Hue is 7.5YR or 10YR throughout the profile.

The A and B horizons are slightly acid or neutral. The Bt horizon is very gravelly clay, very gravelly sandy clay, or very cobbly clay. It is slightly acid or neutral. The C horizon is very gravelly sandy clay loam, extremely gravelly sandy clay loam, or very cobbly clay loam. It is neutral or mildly alkaline.

Tolex Series

The Tolex series consists of shallow, well drained soils on foot slopes and mountainsides. These soils formed in residuum derived dominantly from gneiss, sandstone, metasedimentary rock, and siltstone. Slopes range from 15 to 55 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 41 to 45 degrees F. The soils are loamy-skeletal, mixed Lithic Eutroboralfs.

Typical pedon of Tolex very gravelly sandy loam, 15 to 40 percent slopes, about 1,850 feet south and 2,400 feet east of the northwest corner of sec. 14, T. 17 S., R. 71 W.

Oi—1 inch to 0; ponderosa pine litter.

A—0 to 2 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; about 35 percent gravel, 10 percent cobbles, and 2 percent stones; slightly acid; abrupt smooth boundary.

E—2 to 7 inches; light brown (7.5YR 6/4) extremely gravelly sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; about 70 percent gravel; slightly acid; clear smooth boundary.

Bt1—7 to 10 inches; light brown (7.5YR 6/4) extremely gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds; about 75 percent gravel; slightly acid; clear smooth boundary.

Bt2—10 to 17 inches; light reddish brown (5YR 6/4) extremely gravelly sandy clay loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many moderately thick clay films on faces of peds; about 75 percent gravel; slightly acid; clear irregular boundary.

R—17 inches; fractured gneiss bedrock.

The content of rock fragments is 35 to 80 percent. The depth to bedrock is 10 to 20 inches. The A and E horizons have hue of 10YR or 7.5YR, and the Bt horizon has hue of 7.5YR or 5YR. Reaction is slightly acid or neutral throughout the profile.

The A horizon is very gravelly sandy loam or very channery sandy loam. The Bt horizon has rock fragments that include channers and subangular pebbles.

Travessilla Series

The Travessilla series consists of shallow, well drained soils on hills, hogbacks, canyonsides, ridges, and cuestas. These soils formed in residuum derived from sandstone. Slopes range from 5 to 50 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 48 to 53 degrees F. The soils are loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents.

Typical pedon of Travessilla channery sandy loam, in an area of Travessilla-Rock outcrop complex, 5 to 50 percent slopes; about 1,100 feet north and 500 feet west of the southeast corner of sec. 10, T. 19 S., R. 70 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) channery sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; about 20 percent channers; mildly alkaline; clear smooth boundary.

C—4 to 9 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—9 inches; hard sandstone bedrock.

The content of channers and flagstones is 0 to 35 percent. The depth to bedrock is 4 to 20 inches. Reaction is neutral to moderately alkaline in the A horizon and in the upper part of the C horizon. Hue is 2.5Y to 7.5YR throughout the profile. Small masses of carbonates are visible in the lower part of some pedons. The fine-earth fraction of the A and C horizons is sandy loam or loam.

Troutdale Series

The Troutdale series consists of moderately deep, well drained soils on ridges and side slopes. These soils formed in alluvium over residuum derived dominantly from schist and gneiss. Slopes range from 2 to 15 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 43 to 45 degrees F. The soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Troutdale loam, in an area of Troutdale-Rogert, warm, complex, 2 to 15 percent slopes; about 2,600 feet north and 100 feet west of the southeast corner of sec. 32, T. 20 S., R. 73 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; about 1 percent gravel; clear smooth boundary.

BA—7 to 10 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; about 1 percent gravel; neutral; clear smooth boundary.

Bt1—10 to 14 inches; dark brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common moderately thick clay films on faces of peds; about 1 percent gravel; neutral; clear smooth boundary.

Bt2—14 to 22 inches; brown (10YR 4/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds; about 10 percent gravel; mildly alkaline; clear smooth boundary.

Cr—22 to 60 inches; soft, weathered schist.

The depth to paralithic contact is 20 to 40 inches. The mollic epipedon is 7 to 16 inches thick. The solum is 20 to 40 inches thick. Hue is 10YR or 7.5YR throughout the profile. The content of rock fragments is 0 to 15 percent.

The Bt horizon is sandy clay loam, loam, or clay loam.

Ustic Torriorthents

Ustic Torriorthents are shallow to deep, well drained or somewhat excessively drained soils on fan terrace edges, hills, and mountainsides. These soils formed in residuum and colluvium derived dominantly from shale, siltstone, gneiss, granodiorite, granite, and sandstone. Slopes range from 15 to 80 percent. The average annual precipitation is about 11 to 15 inches, and the average annual air temperature is 43 to 52 degrees F.

Reference pedon of Ustic Torriorthents, in an area of Ustic Torriorthents-Sedillo complex, 15 to 40 percent slopes; about 1,550 feet south and 2,000 feet east of the northwest corner of sec. 21, T. 19 S., R. 70 W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 30 percent gravel and 10 percent cobbles; neutral; clear smooth boundary.

AC—2 to 10 inches; light brownish gray (10YR 6/2) gravelly clay loam, grayish brown (10YR 5/2) moist; weak medium and coarse subangular blocky structure; loose, firm, very sticky and plastic; about 30 percent gravel; mildly alkaline; clear wavy boundary.

C1—10 to 27 inches; light brownish gray (2.5YR 6/2) gravelly clay loam, grayish brown (2.5YR 5/2) moist; massive; very hard, firm, very sticky and very plastic; about 25 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—27 to 42 inches; brownish yellow (10YR 6/6) gravelly loam, yellowish brown (10YR 5/6) moist; massive; slightly hard, friable, slightly sticky and nonplastic; about 25 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2Cr—42 inches; fractured, calcareous sandstone.

The depth to paralithic contact is 14 to more than 60 inches. The content of rock fragments is 35 to 85 percent. The content of gravel is about 25 to 70 percent, and the content of stones and cobbles is about 10 to 20 percent. Reaction is slightly acid to moderately alkaline. Some pedons are dark in color, mainly as a result of the high content of biotite.

Wages Series

The Wages series consists of deep, well drained, moderately permeable soils on foot slopes and fan terraces. These soils formed in alluvial and eolian material. Slopes range from 2 to 9 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 47 to 52 degrees F. The soils are fine-loamy, mixed, mesic Aridic Argiustolls.

Typical pedon of Wages loam, 2 to 9 percent slopes, about 500 feet west of the center of sec. 19, T. 20 S., R. 69 W.

A—0 to 5 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline; clear smooth boundary.

Bt1—5 to 9 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common thin clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Bt2—9 to 15 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; continuous thin clay films on faces of peds and lining pores; mildly alkaline; gradual smooth boundary.

Bw—15 to 21 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; mildly alkaline; gradual smooth boundary.

Bk—21 to 27 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—27 to 60 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; strongly effervescent; moderately alkaline.

The mollic epipedon is 8 to 15 inches thick. The calcium carbonate equivalent is less than 15 percent in the C horizon. The depth to uniformly calcareous material ranges from 15 to 35 inches. Hue is 7.5YR or 10YR throughout the profile.

The A and Bt horizons are neutral or mildly alkaline. The Bt horizon is loam or clay loam. The Bk and C horizons are loam, sandy clay loam, or fine sandy loam. Visible carbonates occur as filaments and soft masses.

Wahatoya Series

The Wahatoya series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone and some gneissic metasedimentary rock. In a few areas, the soils are derived from granite and gneissic metasedimentary rock. Slopes range from 25 to 50 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 42 to 45 degrees F. The soils are loamy-skeletal, mixed Typic Eutroboralfs.

Typical pedon of Wahatoya very gravelly sandy loam, in an area of Wahatoya-Tolex complex, 25 to 55 percent slopes; about 1,000 feet north and 1,300 feet west of the southeast corner of sec. 35, T. 48 N., R. 10 E.

A—0 to 2 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; loose, very friable, nonsticky and nonplastic; about 30 percent gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

E—2 to 10 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; about 50 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

Bt—10 to 20 inches; light yellowish brown (10YR 6/4) extremely gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common moderately thick clay films on faces of peds and on rock fragments; about 60 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

BCt—20 to 38 inches; light yellowish brown (10YR 6/4) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few thin clay films on faces of peds; about 80 percent gravel and 5 percent cobbles; moderately acid; abrupt irregular boundary.

R—38 to 60 inches; hard, fractured sandstone bedrock.

Thickness of the solum and the depth to bedrock range from 20 to 40 inches. Hue is 7.5YR or 10YR throughout the profile.

The A and E horizons are slightly acid or neutral. The Bt horizon is extremely gravelly sandy clay loam or very gravelly sandy loam. It is neutral to moderately acid.

Wann Series

The Wann series consists of deep, somewhat poorly drained soils on low stream terraces. These soils formed in alluvium. Slopes are 0 to 1 percent. The average annual precipitation is 11 to 13 inches, and the average annual air temperature is 50 to 53 degrees F. The soils are coarse-loamy, mixed, mesic Fluvaquentic Haplustolls.

Typical pedon of Wann fine sandy loam, in an area of Wann-Shanta, dry, association; about 1,900 feet north and 1,200 feet west of the southeast corner of sec. 7, T. 19 S., R. 69 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; mildly alkaline; abrupt smooth boundary.

AC—8 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C—12 to 27 inches; light brownish gray (10YR 6/2), stratified sandy loam and silt loam, dark grayish brown (10YR 4/2) moist; when mixed, the texture is sandy loam; massive; hard, friable, slightly sticky and nonplastic; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Cg1—27 to 48 inches; light brownish gray (10YR 6/2), stratified fine sandy loam and silt loam, dark grayish brown (10YR 4/2) moist; when mixed, the texture is fine sandy loam; common fine distinct strong brown (7.5YR 4/6) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Cg2—48 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; about 50 percent gravel and 10 percent cobbles; slightly effervescent; mildly alkaline.

These soils are generally calcareous to the surface, but in some pedons the A horizon is noncalcareous. The mollic epipedon is 8 to 20 inches thick. The C horizon is mainly sandy loam and fine sandy loam and has thin strata of loam, silt loam, silty clay loam, and sand or fine sand. The content of organic carbon ranges from 0.35 to 0.40 percent below a depth of 12 inches. The soils are extremely gravelly sandy loam or extremely cobbly very coarse sand at a depth of 36 inches or more.

Wesix Series

The Wesix series consists of shallow, well drained soils on pediments, canyonsides, cuestas, and mountainsides. These soils formed in residuum derived from limestone. Slopes range from 5 to 50 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 47 to 52 degrees F. The soils are loamy-skeletal, carbonatic, mesic Lithic Ustic Torriorthents.

Typical pedon of Wesix very channery loam, 5 to 40 percent slopes, about 2,500 feet north and 1,700 feet east of the southwest corner of sec. 5, T. 18 S., R. 69 W.

A—0 to 3 inches; brown (7.5YR 5/2) very channery loam, dark brown (7.5YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 40 percent channers and 5 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—3 to 8 inches; pinkish gray (7.5YR 6/2) very channery loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 40 percent channers and 5 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C—8 to 13 inches; pale brown (10YR 6/3) very channery loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; about 40 percent channers and 5 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—13 inches; fractured limestone bedrock.

The depth to bedrock is 7 to 20 inches. The calcium carbonate equivalent ranges from 40 to 80 percent but is as low as 25 percent in the A horizon. Hue is 5YR to 10YR throughout the profile. The content of rock fragments in the A horizon is 35 to 55 percent. The content of rock fragments in the C horizon is mainly 35 to 60 percent but ranges to 90 percent.

Wetmore Series

The Wetmore series consists of shallow, well drained soils on mountainsides and canyonsides. These soils formed in residuum derived from gneiss and granite. Slopes range from 35 to 70 percent. The average annual precipitation is about 17 inches, and the average annual air temperature is 42 to 45 degrees F. The soils are loamy-skeletal, mixed Lithic Eutroboralfs.

Typical pedon of Wetmore very gravelly sandy loam, in an area of Wetmore-Bundo, dry-Rock outcrop complex, 35 to 75 percent slopes; about 2,500 feet south and 50 feet west of the northeast corner of sec. 22, T. 17 S., R. 69 W.

Oi—1 inch to 0; ponderosa pine and Gambel oak litter.

E—0 to 3 inches; very pale brown (10YR 7/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; about 30 percent gravel, 5 percent cobbles, and 1 percent stones; slightly acid; clear smooth boundary.

Bt—3 to 10 inches; yellowish brown (10YR 5/6) very gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; common moderately thick clay films on faces of peds and lining pores; about 55 percent gravel and

5 percent cobbles; slightly acid; clear irregular boundary.
R—10 inches; fractured gneiss bedrock.

The depth to bedrock and to the base of the argillic horizon is 8 to 20 inches. Hue is 10YR or 7.5YR throughout the profile. Reaction is moderately acid to neutral. The content of rock fragments in the Bt horizon is 35 to 75 percent. In most pedons the argillic horizon is discontinuous and has lamellae.

Whiteman Series

The Whiteman series consists of shallow, well drained soils on mountainsides and ridges. These soils formed in residuum derived from tuff, breccia, andesite, and rhyolite. Slopes range from 15 to 30 percent. The average annual precipitation is 18 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are loamy-skeletal, mixed Lithic Mollic Cryoboralfs.

Typical pedon of Whiteman cobbly loam, in an area of Bushvalley-Whiteman cobbly loams, 15 to 50 percent slopes; about 10 feet north and 2,400 feet west of the southeast corner of sec. 2, T. 51 N., R. 11 E.

A—0 to 2 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, sticky or slightly sticky and slightly plastic; about 15 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.
BA—2 to 6 inches; brown (7.5YR 5/4) very gravelly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; about 25 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.
Bt—6 to 11 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common moderately thick clay films on faces of peds; about 40 percent gravel and 5 percent cobbles; neutral; abrupt irregular boundary.
R—11 inches; tuff.

The depth to bedrock and to the base of the argillic horizon is 10 to 20 inches. The content of rock fragments is 35 to 70 percent in the control section. Reaction is neutral or mildly alkaline throughout the profile.

The A horizon has hue of 10YR or 7.5YR. The Bt horizon is very gravelly clay loam, very gravelly sandy clay loam, or very cobbly clay loam.

Wiley Series

The Wiley series consists of deep, well drained soils on fan terraces and foot slopes. These soils formed in alluvium and in eolian fine sands and silt. Slopes range from 1 to 6 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 53 degrees F. The soils are fine-silty, mixed, mesic Ustollic Haplargids.

Typical pedon of Wiley loam, cool, 2 to 6 percent slopes, about 1,700 feet south and 600 feet west of the northeast corner of sec. 32, T. 18 S., R. 71 W.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium platy structure; soft, very friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.
Bt—4 to 15 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common thin clay films on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.
Btk—15 to 21 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common thin clay films on faces of peds; few fine filaments of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.
Bk1—21 to 32 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, firm, sticky and slightly plastic; common medium filaments and soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.
Bk2—32 to 40 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many medium filaments and soft masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.
2Bk3—40 to 60 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

The depth to calcareous material is 0 to 7 inches. Depth to the base of the argillic horizon is 12 to 40 inches. The content of rock fragments is 0 to 5 percent. Hue is 7.5YR or 10YR throughout the profile.

The A horizon is loam or silt loam. The B horizon is silty clay loam or silt loam.

Youga Series

The Youga series consists of deep, well drained soils on foot slopes and fans. These soils formed in alluvium and colluvium. Slopes range from 3 to 10 percent. The average annual precipitation is 17 to 20 inches, and the average annual air temperature is 40 to 44 degrees F. The soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Youga sandy loam, 3 to 10 percent slopes, about 1,800 feet east and 2,450 feet south of the northwest corner of sec. 3, T. 17 S., R. 73 W.

A1—0 to 5 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; about 10 percent gravel; slightly acid; abrupt smooth boundary.

A2—5 to 12 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; about 5 percent gravel; slightly acid; clear smooth boundary.

Bt1—12 to 33 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and slightly plastic; many moderately thick clay films on faces of peds and lining pores; about 25 percent gravel; neutral; clear smooth boundary.

Bt2—33 to 37 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; few moderately thick clay films on faces of peds and lining pores; about 30 percent gravel; mildly alkaline; gradual wavy boundary.

BC—37 to 42 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; about 30 percent gravel; mildly alkaline; gradual wavy boundary.

C—42 to 60 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; about 40 percent gravel; mildly alkaline.

The mollic epipedon is 9 to 15 inches thick. Depth to the base of the argillic horizon is 20 to 40 inches. The content of rock fragments is 0 to 35 percent in the control section. The depth to bedrock is 40 inches or more. Hue is 10YR or 7.5YR throughout the profile.

The A horizon is slightly acid or neutral. The Bt horizon is gravelly sandy clay loam, gravelly clay loam, clay loam, or sandy clay loam. The Bt and C horizons are neutral or mildly alkaline.

Formation of the Soils

Five important factors determine the rate and nature of horizon development. These are the composition of the parent material; the climate under which the soil material accumulated or weathered; relief, or lay of the land; plants and animals on and in the soil; and the length of time that the forces of soil formation have acted on the soil material. The relative effect of these factors varies from one place to another.

Climate and vegetation are the active factors of soil formation. They alter the accumulated soil material and bring about the development of genetically related horizons. Relief, mainly through its influence on temperature and runoff, modifies the effects of climate and vegetation. The parent material also affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. A long time is generally required for the development of distinct horizons.

Parent material undergoes many changes over time. Soil begins to form into a sequence of distinct horizons as soon as the parent material is deposited and stabilized with vegetation. The horizons vary in color, texture, chemistry, structure, and other properties. The basic processes of horizon differentiation include additions, removals, transfers, and transformations of substances in the soil. Some forms of these processes promote differentiation, and others retard it.

In the early stages of soil formation, the soil properties are largely inherited from the parent material. Organic matter accumulates in the surface layer if conditions favor stability of humus, and the A horizon darkens with this accumulation. As time passes, a B horizon develops if the landform remains stable and the climate favorable. In a B horizon, the soil material aggregates into blocky structure and generally becomes more clayey as a result of the accumulation of silicate clays. It also tends to become redder in hue as a result of the accumulation of iron oxides. Calcium carbonate, if it is present, is generally leached downward through the soil profile. This leaching affects the pH level of each horizon in relation to the other horizons.

Many other chemical and physical changes occur in parent material and in young soils. These changes affect the development of the soils. The rate of maturation varies greatly from place to place. In some positions on the landscape, the soils do not have an opportunity to age.

Parent Material

A wide diversity of color, mineralogy, reaction, and other physical and chemical properties is evident in the parent materials of the soils in the survey area. This diversity is largely a result of the wide variety of source bedrock strata. Many types of sedimentary and igneous rocks can be observed in the survey area. The method of material accumulation also is a factor in determining such soil characteristics as the content of rock fragments and stratification.

Generally, there are three main kinds of parent material—residual, transported, and lacustrine or marine. The parent materials in the survey area are mainly transported and residual. The transported materials include alluvium, colluvium, glacial outwash, and glacial till.

Alluvium. Alluvium is the most extensive transported material in the survey area. The flood plains and terraces of streams consist of recently deposited alluvium and some alluvium of Pleistocene age.

Examples of soils that formed in recent alluvium are Adderton, Bloom, Jodero, Limon, Shanta, and Wann soils. These soils reflect the wide variety in strata laid down periodically, one on top of another, by streams. Wann soils, in particular, are thinly stratified. Adderton and Shanta soils have a thick, dark surface layer because the material that was most recently deposited is topsoil that eroded from upland landforms. The dominant texture of the soils that formed in recent alluvium varies from a sandy texture in the Wann soils and adjacent areas of riverwash to silty clay in the Limon soils. Because the deposits on the lowlands are generally thick, the soils are deep. Coarse textured soils are generally closest to the stream channels. High floodwaters spread fine material nearer the uplands and on the inside of turns in channels. Fine textured soils are in such locations.

Examples of soils that formed in Pleistocene alluvium are Bronell, Curecanti, Hoodle, Libeg, Tellura, and Tecolote soils. These soils are gravelly and cobbly because the streams that formed the terraces carried a heavy bedload of gravel and cobbles. Except for the Tellura soils, they have a high content of quartzite and mica sands derived from Precambrian rocks. The mineralogy of the Tellura soils reflects the andesite, rhyolite, and volcanic rocks from which the parent material is derived. The soils that formed in Pleistocene alluvium show a greater degree of development than the soils that formed in recent alluvium. For example, the older soils have a clayey B horizon caused by the leaching of clays from the surface layer by water moving downward through the parent material.

A more recent mantle of Holocene age has been deposited on many Pleistocene terraces. The deposits appear to be primarily alluvial, but some of the materials may have been deposited by the wind. Many of the mantles are not gravelly. They consist mainly of clay, silt, and fine sand. The soils also have a clayey B horizon, but the B horizon is thinner and at a shallower depth than in soils that formed in the older Pleistocene alluvium. Fort Collins, Nunn, and Wiley soils are examples of soils that formed in these deposits.

Colluvium. Colluvium is an important type of parent material on steep slopes. On some of the steepest mountainsides and canyonsides, this material is less than 20 inches thick. More commonly, however, it is 5 feet or more thick.

Colluvium generally includes a high content of rock fragments. The fragments are derived from a wide variety of sedimentary, igneous, and metamorphic rocks. The fine-earth portion and, therefore, most physical and chemical characteristics of the material are determined by the kind of source rock. For example, colluvium derived from igneous and metamorphic rocks generally is more sandy and clayey and less calcareous than material derived from limestone.

Woodland soils on mountainsides include Bundo, Granile, Larand, and Seitz soils. These are deep soils that show a significant degree of development. Ess soils are examples of grassland colluvial soils. Amalia and Bronell Variant soils, which formed under pinyon and juniper, are less well developed than other woodland soils, but they are deep and have a high content of rock fragments.

Residuum. Residuum is the dominant type of parent material in many areas in the mountains and foothills. It is extensive on such landforms as cuestas and hogbacks formed by tilted sedimentary rock in the foothills. Rocks include a variety of limestones, sandstones, and mudstones, and many soils in the foothills and mountains formed in material that weathered in place from a variety of igneous and metamorphic rocks. Granite, gneiss, rhyolite, tuff, and andesite are particularly important in the survey area. Soils that formed in residual volcanic ash are of very limited extent.

The nature of the residual parent material and of the soils that formed in it depends to a great extent on the source rock. Sandstone, gneiss, and granite yield a relatively high proportion of sand and clay and, generally, a relatively low amount of silt. Except for calcareous sandstone, these materials are generally noncalcareous. The colors of the soils reflect quite closely the colors of the rocks. An example is the red Rizozo soils, which formed in residuum derived from the red Fountain sandstone formation.

Because of the semiarid climate in the survey area, the rocks have generally yielded only a thin mantle of residuum. Residual soils also are commonly in erosional positions. Therefore, the soils are commonly shallow over bedrock because the material erodes and is transported as quickly as it weathers.

Soils that formed in limestone and mudstone generally have a relatively high content of silt and are more loamy than soils that formed in material derived from granite and sandstone. Soils that formed in limestone are generally calcareous. They generally do not have a subsoil of accumulated clay. Examples are soils of the Pendant, Penrose, Minnequa, and Wesix series.

Glacial Outwash and Glacial Till. These types of parent material are of limited extent in the survey area, particularly the glacial till. The materials generally consist of a high content of cobbles, stones, and pebbles. The fine-earth fraction generally has a high content of sand and a relatively low content of silt. Also, the pH of these parent materials is generally slightly acid or neutral. Because of the high sand content, the leaching of clays downward within the profile is readily apparent. Soils of the Curecanti, Larand, and Libeg series are examples of glacial soils. They have a cobbly or stony surface layer, a subsoil of sandy clay loam, and a substratum of extremely cobbly or gravelly sandy loam.

Climate

Climate affects soil formation through its influence on the kind and amount of vegetation that grows, on the rate at which minerals weather, on the activity level of micro-organisms, and on runoff and erosion. Precipitation and temperature are the most important climatic factors, but wind frequency and velocity, humidity, and the amount of cloud cover also impact soil formation.

The amount of precipitation that actually infiltrates the soil is critical to the rate of weathering. Water is the medium in which chemical reactions take place. It is also the main source of hydrogen, a principal agent of weathering. Downward-moving water carries end products of chemical and biochemical reactions. The depth of weathering and the depth to which materials move through the soil depend to a great extent on the effective precipitation. Temperature directly influences the rate of chemical and biological processes.

The survey area includes three distinct climatic zones. These are the plains and the lower foothills, high foothills and the lower mountains, and high mountains.

The plains and the lower foothills are semiarid and have an average annual precipitation of about 11 to 13 inches. Summers are hot and relatively long. Some of the precipitation occurs during short, high-intensity thunderstorms. The rate of rainfall is more rapid than can be absorbed by a loamy and clayey surface layer, and a high percentage of the water is lost as runoff. Erosion, rather than soil development, is the result. The vegetation is dominated by drought-tolerant grasses, and production is generally about 700 pounds per acre or less per year.

The eastern edge of Fremont County is the driest part of the survey area. The average annual rainfall gradually decreases with increasing distance from the mountains. Soils on the plains, such as Kim, Shingle, and Limon soils, commonly have not developed distinct horizons. The A horizon of these soils is generally 4 inches thick or less and is light colored.

The soils in the lower foothills are mainly shallow soils over steeply upturned sedimentary strata. The climate is too dry for significant horizon development to occur. The roots of pinyon and juniper effectively penetrate bedrock along fractures. They gain added moisture and nutrients from small pockets of soil and compete favorably with the grasses and other plants. Deep soils in the valley parks commonly have a dark A horizon and have a subsoil that is about 20 inches or less in thickness. Wages and Wiley soils are examples.

The soils on high foothills and the lower mountains are similar to soils on steep slopes in the foothills. The precipitation is only slightly higher in these areas than on the plains. Summer days are warm, but these areas are much cooler in other seasons than the areas on the plains. The warm season is generally about a month shorter than on the plains. The soils on steep slopes, such as Boyle soils, are shallow, but they have a dark A horizon and a thin subsoil of accumulated clay. Pinyon and juniper dominate the vegetation. Deep soils on terraces and fans in the valleys, such as Martinsdale soils, commonly have a dark A horizon about 7 to 10 inches thick and a solum about 24 inches or more in thickness. The calcium carbonate is generally leached to a depth of 15 or more inches.

In the high mountains, the average annual precipitation is generally about 18 inches or more. The average temperature is low, and the warm season is short. The duration of cloud cover is greater than in the lower areas. Less soil moisture is lost because of evaporation and plant transpiration than in the warmer and drier areas, and thus the effective precipitation is greater. North-facing slopes are generally forested, and forest litter influences the development of distinct horizons.

In the soils of the high mountains, the base of the subsoil is commonly at a depth of 3 feet or more. The A horizon is very dark. In areas that support grass plant communities, the A horizon is generally 10 or more inches thick. The change in color, texture, and other properties is very distinct between horizons. Tellura soils are examples of soils in the high mountains. Because the cool temperatures and short summers tend to offset the effects of added precipitation, shallow soils thicken slowly. Also, the humus is more coarse than in warmer zones because of a slower rate of decomposition.

Living Organisms

Plants and animals are important factors of soil development. Dead plants and animals are decomposed by micro-organisms and other soil fauna. This process results in the recycling of the nutrients used by plants, the addition of organic matter, and a darkening of the upper part of the soil. Small animals, earthworms, and insects, through burrowing and other activities, can retard the development of distinct soil horizons by mixing soil layers. Soil micro-organisms influence the development of soil structure. Nitrogen is added to the soil by micro-organisms alone or in association with certain plant species.

Living vegetation helps to control erosion by stabilizing the soil surface. Plant roots form channels and increase the penetration of the soil by water and air. The canopy cover of trees shades the soil and reduces soil temperature. In turn, the rate of evaporation of moisture from soils is reduced, although cooler temperatures result in a slower rate of chemical processes.

Coniferous forests are dominant in the mountains at the higher elevations, where the annual precipitation is about 16 to 25 inches. The acidic litter of conifers causes the leaching of silicate clays and other minerals.

Organic matter breaks down rapidly, and only small amounts accumulate. These factors result in the formation of Alfisols, such as Granile and Seitz soils.

Different soils have developed in the adjacent areas that support grasses than in the wooded areas. Organic matter, or humus, resulting from the decomposition of grasses is more stable than that resulting from the decomposition of trees. Also, it accumulates more readily as vegetation is recycled. Soils in these areas have a thick, dark surface layer and are classified as Mollisols. Ess and Hoodle soils are examples.

Grasses are the dominant type of vegetation on the plains. Annual precipitation is only about 12 inches, and the temperatures are warmer than in the higher areas. As a result, the production of vegetation is lower and organic matter accumulates more slowly. Soils on the plains have a light-colored surface layer and are classified as Aridisols or Entisols. Wiley soils are examples of Aridisols, and Kim soils are Entisols.

Soils in the foothills, at the mid elevations, commonly have a cover of grasses, shrubs, and scattered trees. The precipitation is higher than on the plains, and the production of vegetation is higher. The soils have a dark surface layer, but the surface layer is not as dark or as thick as that of the Ess and Hoodle soils. Mollisols, such as Teaspoon and Curecanti soils, have formed in these areas.

Human activity has changed the soils in areas of cropland and in urban areas. Fortunately, soil erosion has not been a significant source of change in most cases. The structure, color, and consistence of the plow layer have been altered in cropped areas. In the drier areas where organic matter has been added, the plow layer has become darker. Plowing breaks down soil structure. Many years of growing crops have reduced the organic matter content in areas of Nunn soils, but cultivation generally has been beneficial to the soils in the survey area.

Relief

Relief affects the development of distinct soil horizons through its influence on soil drainage, erosion, soil temperature, and effective precipitation and runoff. The relief in the survey area is diverse, ranging from nearly level stream terraces and plains to very steep mountains.

In the less sloping areas, the potential for runoff and water erosion is low. Rainfall in these areas mainly tends to percolate down through the soil profile. The movement of relatively greater amounts of water through the soil affects the differentiation of the profile into distinct horizons and results in changes in the mineralogy. Therefore, in soils that formed in the same parent material, the influence of relief can be seen in differences in color, in the thickness of the solum, and in the degree of horizonation.

Low-lying areas often receive both surface runoff and excess soil moisture from the surrounding uplands or from streams. Some soils on flood plains and low terraces have a fluctuating water table and poor drainage, which result in rust-colored mottles and a grayish soil matrix and, commonly, in the accumulation of salts near the surface. A fluctuating water table, however, retards such genetic processes as the development of a clayey subsoil. Bloom soils, for example, have grayish colors and do not have a clayey subsoil. In marshy areas where stagnant water collects, the breakdown of organic matter also is retarded and layers of peat build up.

The effective precipitation in low areas results in lush vegetation. If the soil is well drained, natural recycling of vegetation results in a thick surface layer darkened by the buildup of humus. Cochetopa soils, for example, have a thick, dark surface layer.

In areas that have steep slopes, the potential for runoff and erosion is greater than in the less sloping areas. Shallow soils are common in the steeper areas because the soil material may erode almost as rapidly as it weathers from the underlying bedrock. Soils of the Louviers and Rentsac series are examples of shallow soils on steep slopes. Soils on steep slopes generally show less pedogenic development than soils in less sloping areas over the same period of time.

Aspect, a factor related to relief, influences soil formation through its effect on soil temperature and the capacity of soils to retain moisture. Soils on north-facing slopes are cooler and retain moisture longer than soils on south-facing slopes. Therefore, the production of vegetation is generally higher on north-facing slopes than on south-facing slopes.

Differences in soil temperature and moisture cause differences in the type of vegetation. For example, north-facing slopes in the mountains generally have a dense stand of conifers. Soils that have a bleached subsurface layer, such as Seitz soils, are common on north-facing slopes. On the warmer south-facing slopes, grass is the dominant type of vegetation. Ess soils are examples of soils on south-facing slopes. They have a dark, humus-rich surface layer.

Time

Compared to the cycle of human life, a large amount of time is required for the genetic development of a soil. In a geological sense, however, soil genetic processes can be completed in a very short period of time. For example, the development of a thin argillic horizon, or a subsoil in which clay has accumulated, requires about 200 to 1,000 years.

The length of time required for a particular genetic process varies greatly from one soil to another because of differences in climate, topography, parent material, and living organisms. Therefore, over a given period of time a large degree of development may occur in one soil and very little development may occur in another. Conditions that favor a shorter time period for development include a warm, humid climate; flat or gently sloping terrain; good drainage; unconsolidated parent material, such as alluvial or glacial deposits; material that is low in content of lime; and a moderate amount of clays, low pH, and vegetation that produces acidic residue. Characteristics used to compare the maturity of soils include color, degree of structure in the subsoil, evidence of clay movement, thickness of the solum, and the depth to translocated calcium carbonates.

Differences in pedogenic development in relation to age are apparent in comparing the Kim and Fort Collins soils. Both soils formed under the same climate and support similar kinds of vegetation. Kim soils, however, formed in recent alluvium on the more sloping landforms. These soils are young because little profile development has taken place. The subsoil shows little or no evidence of clay accumulation, and calcium carbonate has not been leached from the surface layer. Fort Collins soils formed in older alluvium on upland fans. The greater amount of time since deposit has resulted in a greater degree of development than in the Kim soils. Clays and hydrous oxides have been leached from the surface layer and have accumulated in the subsoil. Calcium carbonates have also been leached from the surface layer and deposited below the layer of clay accumulation.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Basin. An intermontane structure with limited surface outlets.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Break. A marked or abrupt change or inflection in a slope.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cuesta. An asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited for crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface for long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Grus. Fragmental material derived from the disintegration of granite and granitic rock.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Hogback. A sharp-crested, symmetric ridge formed by highly tilted resistant rock layers.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Intermontane. Between or among mountains.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knob. A peak or other projection from the top of a hill or mountain.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and a surface of considerably bare rock. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Park. A level, open area that is dominantly covered with grass. It is surrounded by mountains or forested areas.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, generally sharp crested with steep sides and forming an extended upland between valleys.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rim. The border or edge of a landform, such as the edge along the top of a canyon.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet. In this survey, basal area is used in place of age. Basal area is the total estimated area of tree trunks at a height of 1 foot. Index basal area is the estimated basal area of equal wood production rate potential, but the stand is uniformly 5 inches in diameter.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{+} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Swale. A troughlike depression.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Canon City, Colorado)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	50.0	22.1	36.1	69	-7	74	0.34	0.05	0.57	1	4.7
February----	52.9	25.1	39.0	72	-3	107	.39	.07	.64	1	6.0
March-------	56.3	28.3	42.3	77	2	165	.85	.35	1.27	3	8.9
April-------	65.1	37.6	51.4	82	18	347	1.35	.36	2.15	3	4.5
May---------	74.1	46.4	60.3	90	28	629	1.72	.41	2.75	4	.1
June--------	84.6	55.4	70.0	98	37	900	1.17	.45	1.79	3	.0
July--------	89.5	61.7	75.6	100	49	1,104	1.80	.73	2.71	5	.0
August------	87.2	59.8	73.5	97	46	1,039	1.76	.71	2.64	5	.0
September---	80.2	50.9	65.6	94	32	768	1.00	.31	1.57	2	.5
October-----	70.6	41.5	56.1	86	22	499	.94	.13	1.57	2	2.1
November----	58.2	29.9	44.1	76	5	184	.68	.18	1.08	2	4.1
December----	51.8	25.2	38.5	71	-2	98	.49	.09	.81	2	6.5
Yearly:											
Average---	68.4	40.3	54.4	---	---	---	---	---	---	---	---
Extreme---	---	---	---	100	-11	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,914	12.49	9.10	15.83	33	37.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Canon City:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 16	May 27	June 12
2 years in 10 later than--	May 2	May 12	May 28
5 years in 10 later than--	Apr. 6	Apr. 15	Apr. 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 19	Oct. 8	Sept. 24
2 years in 10 earlier than--	Oct. 25	Oct. 14	Sept. 30
5 years in 10 earlier than--	Nov. 6	Oct. 24	Oct. 12
Salida:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 18	June 2	June 16
2 years in 10 later than--	May 13	May 27	June 11
5 years in 10 later than--	May 2	May 17	May 31
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 26	Sept. 13	Aug. 24
2 years in 10 earlier than--	Oct. 1	Sept. 18	Aug. 31
5 years in 10 earlier than--	Oct. 10	Sept. 27	Sept. 13

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
Canon City:			
9 years in 10	173	153	130
8 years in 10	186	165	140
5 years in 10	209	187	160
2 years in 10	232	210	180
1 year in 10	244	221	190
Salida:			
9 years in 10	138	112	81
8 years in 10	146	119	89
5 years in 10	160	132	104
2 years in 10	175	145	119
1 year in 10	182	152	127

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Adderton loam, 2 to 6 percent slopes	6,840	0.8
2	Amalia very gravelly loam, 25 to 50 percent slopes	6,200	0.7
3	Aquic Ustifluvents	4,400	0.5
4	Aquolls, 0 to 5 percent slopes	2,160	0.2
5	Arents, 10 to 45 percent slopes	960	0.1
6	Bloom loam, 0 to 2 percent slopes	460	0.1
7	Boyle very gravelly sandy loam, 10 to 40 percent slopes	54,790	6.3
8	Boyle-Martinsdale complex, 3 to 20 percent slopes	7,440	0.8
9	Boyle-Rock outcrop complex, 40 to 60 percent slopes	38,400	4.4
10	Bronell gravelly sandy loam, 2 to 15 percent slopes	5,720	0.6
11	Bronell-Kerhayden complex, 10 to 40 percent slopes	9,220	1.0
12	Bronell Variant-Wesix-Rock outcrop complex, 30 to 60 percent slopes	720	0.1
13	Bundo very cobbly sandy loam, 30 to 60 percent slopes	7,640	0.9
14	Bushvalley cobbly loam, 5 to 40 percent slopes	23,760	2.7
15	Bushvalley-Whiteman cobbly loams, 15 to 50 percent slopes	14,520	1.7
16	Cascajo very gravelly sandy loam, 10 to 40 percent slopes	1,720	0.2
17	Cascajo Variant gravelly sandy loam, 5 to 12 percent slopes	880	0.1
18	Casvare-Teaspoon complex, 20 to 50 percent slopes	9,160	1.0
19	Cathedral-Rock outcrop complex, 45 to 80 percent slopes	15,850	1.8
20	Cerrillos gravelly sandy loam, 3 to 8 percent slopes	2,000	0.2
21	Chittum sandy loam, dry, 5 to 20 percent slopes	1,680	0.2
22	Coaldale very gravelly sandy loam, 20 to 45 percent slopes	22,880	2.6
23	Cochetopa clay loam, 2 to 6 percent slopes	2,320	0.3
24	Corpening gravelly loam, 5 to 25 percent slopes	600	0.1
25	Cryoborolls, 15 to 35 percent slopes	4,040	0.5
26	Cumulic Cryaquolls, 2 to 5 percent slopes	2,000	0.2
27	Curecanti gravelly sandy loam, 4 to 10 percent slopes	1,720	0.2
28	Curecanti very cobbly sandy loam, 15 to 45 percent slopes	2,160	0.2
29	Curecanti Variant extremely cobbly loam, 8 to 20 percent slopes, very stony	720	0.1
30	Dumps and Pits	1,040	0.1
31	Ess very gravelly sandy clay loam, 20 to 45 percent slopes	7,320	0.8
32	Ess very gravelly loam, 30 to 50 percent slopes	7,000	0.8
33	Ess-Bushvalley complex, 10 to 45 percent slopes	14,680	1.7
34	Fort Collins loam, 1 to 4 percent slopes	1,680	0.2
35	Fort Collins loam, cool, 0 to 2 percent slopes	640	0.1
36	Fort Collins loam, cool, 2 to 5 percent slopes	4,920	0.6
37	Fort Collins Variant loam, 3 to 8 percent slopes	920	0.1
38	Granile very gravelly sandy loam, 4 to 25 percent slopes	2,000	0.2
39	Granile very gravelly sandy loam, 25 to 45 percent slopes	3,240	0.4
40	Granile-Guffey very gravelly sandy loams, 25 to 50 percent slopes	12,800	1.5
41	Haploborolls, very stony-Rock outcrop complex, 40 to 90 percent slopes	14,560	1.7
42	Heath cobbly loam, 5 to 30 percent slopes	1,880	0.2
43	Herakle-Rock outcrop complex, 15 to 45 percent slopes	1,520	0.2
44	Hodden gravelly loam, 3 to 8 percent slopes	600	0.1
45	Hoodle loam, 5 to 20 percent slopes	9,160	1.0
46	Jodero sandy loam, 2 to 5 percent slopes	2,960	0.3
47	Jodero Variant clay loam, 1 to 3 percent slopes	240	*
48	Kim loam, 0 to 3 percent slopes	2,440	0.3
49	Kim loam, 3 to 8 percent slopes	5,080	0.6
50	Kim loam, cool, 3 to 8 percent slopes	9,280	1.1
51	Kim loam, moderately wet, 0 to 3 percent slopes	720	0.1
52	Kim-Cascajo complex, 2 to 15 percent slopes	4,080	0.5
53	Kim-Shingle complex, 3 to 20 percent slopes	6,200	0.7
54	Lakehelen-Rock outcrop complex, 45 to 80 percent slopes	9,840	1.1
55	Larand very gravelly fine sandy loam, 10 to 40 percent slopes	9,960	1.1
56	Larkson stony loam, 5 to 20 percent slopes	1,480	0.2
57	Libeg extremely cobbly sandy loam, 10 to 20 percent slopes	2,280	0.3
58	Limon silty clay loam, saline	2,960	0.3
59	Limon silty clay loam, moderately wet, 0 to 2 percent slopes	2,160	0.2
60	Limon silty clay loam, moderately wet, rarely flooded, 0 to 1 percent slopes	1,880	0.2
61	Limon-Gaynor silty clay loams, 0 to 3 percent slopes	1,000	0.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
62	Limon-Gaynor silty clay loams, 3 to 12 percent slopes	4,720	0.5
63	Limon-Gaynor silty clay loams, moderately wet, 0 to 3 percent slopes	320	*
64	Louviers-Travessilla complex, 20 to 50 percent slopes	10,560	1.2
65	Manvel silt loam, 0 to 3 percent slopes	6,560	0.8
66	Manvel silt loam, 3 to 8 percent slopes	8,960	1.0
67	Manvel silty clay loam, saline	2,200	0.2
68	Manzanola loam, 1 to 5 percent slopes	3,280	0.4
69	Martinsdale sandy loam, 3 to 12 percent slopes	10,280	1.2
70	Martinsdale Variant sandy loam, 2 to 5 percent slopes	960	0.1
71	Midway clay loam, 3 to 15 percent slopes	4,880	0.6
72	Midway-Cascajo complex, 10 to 40 percent slopes	6,880	0.8
73	Morset loam, 2 to 8 percent slopes	2,240	0.3
74	Mussel-Bronell complex, 2 to 15 percent slopes	5,960	0.7
75	Neville fine sandy loam, 3 to 8 percent slopes	1,960	0.2
76	Nunn stony loam, 3 to 8 percent slopes	560	0.1
77	Nunn loam, 2 to 5 percent slopes	2,160	0.2
78	Nunn clay loam, 0 to 2 percent slopes	4,560	0.5
79	Nunn clay loam, 2 to 8 percent slopes	1,760	0.2
80	Otero loamy fine sand, 3 to 8 percent slopes	520	0.1
81	Otero fine sandy loam, 3 to 8 percent slopes	800	0.1
82	Pendant extremely gravelly loam, 10 to 40 percent slopes, very stony	3,640	0.4
83	Penrose-Minnequa complex, 2 to 25 percent slopes	13,120	1.5
84	Penrose-Rock outcrop complex, 25 to 40 percent slopes	5,560	0.6
85	Querida gravelly sandy loam, 2 to 8 percent slopes	1,640	0.2
86	Raleigh-Rock outcrop complex, 15 to 40 percent slopes	11,520	1.3
87	Redcameron-Rock outcrop-Teaspoon complex, 20 to 70 percent slopes	8,920	1.0
88	Rentsac very channery loam, 20 to 55 percent slopes	6,660	0.8
89	Rentsac Variant channery loam, 5 to 25 percent slopes	640	0.1
90	Resort very gravelly sandy loam, 20 to 45 percent slopes	15,120	1.7
91	Resort-Rock outcrop complex, 30 to 60 percent slopes	8,480	1.0
92	Riverwash	1,560	0.2
93	Rizozo-Neville complex, 3 to 30 percent slopes	3,440	0.4
94	Rizozo-Rock outcrop complex, 15 to 45 percent slopes	1,800	0.2
95	Rock outcrop	1,880	0.2
96	Rogert very gravelly sandy loam, warm, 10 to 40 percent south slopes	11,840	1.4
97	Rogert very gravelly sandy loam, warm, 15 to 40 percent slopes	28,280	3.2
98	Roygorge very gravelly sandy clay loam, 25 to 50 percent slopes	14,440	1.6
99	Sawfork very cobbly loam, 8 to 40 percent slopes	2,520	0.3
100	Sedillo cobbly sandy loam, 4 to 25 percent slopes	5,880	0.7
101	Sedillo very gravelly loam, 1 to 5 percent slopes	200	*
102	Seitz gravelly fine sandy loam, 20 to 40 percent slopes	12,880	1.5
103	Seitz-Bushvalley complex, 15 to 50 percent slopes	6,680	0.8
104	Shanta loam, 0 to 3 percent slopes	2,440	0.3
105	Shanta loam, dry, 0 to 3 percent slopes	2,000	0.2
106	Shanta-Nederland association	1,800	0.2
107	Shingle very cobbly sandy loam, 10 to 40 percent slopes	1,960	0.2
108	Shingle loam, 3 to 20 percent slopes	2,200	0.2
109	Shrine loam, 2 to 8 percent slopes	840	0.1
110	Swissvale-Rentsac complex, 20 to 55 percent slopes	8,480	1.0
111	Teaspoon very gravelly sandy loam, 15 to 45 percent slopes	4,000	0.5
112	Tecolote very gravelly sandy loam, 15 to 40 percent slopes	1,920	0.2
113	Tecolote very cobbly sandy loam, 5 to 20 percent slopes	960	0.1
114	Tellura gravelly clay loam, 4 to 25 percent slopes	5,000	0.6
115	Tolex very gravelly sandy loam, 15 to 40 percent slopes	7,840	0.9
116	Tolex-Larkson complex, warm, 25 to 50 percent slopes	360	*
117	Travessilla channery loam, 5 to 20 percent slopes	6,680	0.8
118	Travessilla-Rock outcrop complex, 5 to 50 percent slopes	20,570	2.4
119	Troutdale-Rogert, warm, complex, 2 to 15 percent slopes	4,920	0.6
120	Ustic Torriorthents, bouldery-Rock outcrop complex, 35 to 90 percent slopes	77,400	8.9
121	Ustic Torriorthents-Sedillo complex, 15 to 40 percent slopes	23,530	2.7
122	Wages loam, 2 to 9 percent slopes	4,360	0.5

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
123	Wahatoya-Tolex complex, 25 to 55 percent slopes	2,760	0.3
124	Wann-Shanta, dry, association	2,320	0.3
125	Wesix very channery loam, 5 to 40 percent slopes	7,840	0.9
126	Wetmore-Bundo, dry-Rock outcrop complex, 35 to 75 percent slopes	14,280	1.6
127	Wetmore-Rock outcrop complex, 40 to 80 percent slopes	12,600	1.4
128	Wiley loam, cool, 2 to 6 percent slopes	4,880	0.6
129	Wiley silt loam, 1 to 6 percent slopes	5,640	0.6
130	Youga sandy loam, 3 to 10 percent slopes	1,360	0.2
	Water	160	*
	Total	873,400	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS

(Yields are those that can be expected under a high level of management and with adequate irrigation. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability (irrigated)	Alfalfa hay	Grass hay	Corn silage	Oats
		Tons	Tons	Tons	Bu
3------------------------ Aquic Ustifluvents	IVw	6.0	3.5	25	120
4------------------------ Aquolls	Vw	---	3.0	---	---
6------------------------ Bloom	IVw	---	2.0	---	---
20----------------------- Cerrillos	IIIe	4.0	2.5	---	90
26----------------------- Cumulic Cryaquolls	Vw	---	1.5	---	---
34----------------------- Fort Collins	IIe	6.0	3.5	26	120
35----------------------- Fort Collins	IIe	5.5	3.0	---	120
46----------------------- Jodero	IIIe	4.0	2.5	---	120
48----------------------- Kim	IIe	6.0	3.5	26	120
49----------------------- Kim	IIIe	3.5	2.5	20	90
50----------------------- Kim	IIIe	3.5	2.5	---	95
51----------------------- Kim	IIe	6.0	4.0	25	120
58----------------------- Limon	IIIs	4.0	3.0	---	110
59----------------------- Limon	IIIs	5.0	3.5	22	110
60----------------------- Limon	IIIw	5.0	3.5	22	110
61----------------------- Limon-Gaynor	IIIe	4.0	2.5	---	110
63----------------------- Limon-Gaynor	IIIs	4.5	3.0	---	110
65----------------------- Manvel	IIe	5.0	3.5	---	120

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability (irrigated)	Alfalfa hay	Grass hay	Corn silage	Oats
		Tons	Tons	Tons	Bu
66------------------------ Manvel	IIIe	3.5	3.0	---	90
67------------------------ Manvel	IIIs	4.0	2.5	---	100
69------------------------ Martinsdale	IVe	4.0	2.0	---	100
70------------------------ Martinsdale Variant	IVe	4.5	2.5	---	110
74:					
Mussel-------------------	IVe	4.5	2.0	---	100
Bronell.					
75------------------------ Neville	IIIe	3.5	2.5	---	90
77------------------------ Nunn	IIIe	4.0	2.5	---	100
78------------------------ Nunn	IIs	5.0	3.0	---	120
80------------------------ Otero	IVe	4.0	3.0	---	110
83------------------------ Penrose-Minnequa	IVe	2.0	1.0	---	80
85------------------------ Querida	IIIe	4.0	2.0	---	110
104----------------------- Shanta	IIe	5.0	3.5	---	120
105----------------------- Shanta	IIe	6.0	4.0	26	120
106:					
Shanta-------------------	IIe	5.0	3.5	---	120
Nederland.					
109----------------------- Shrine	IIIe	4.5	2.5	---	110
124:					
Wann---------------------	IIw	5.0	3.5	23	110
Shanta-------------------	IIe	6.0	4.0	26	110

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

(PPT means precipitation zone)

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
1 Adderton	Loamy Park #222	Favorable	2,000	Arizona fescue	20
		Normal	1,500	Mountain muhly	20
		Unfavorable	1,000	Parry oatgrass	20
				Prairie junegrass	10
				Needleandthread	10
				Western wheatgrass	5
				Slender wheatgrass	5
				Sedge	5
2 Amalia	Pinyon-Juniper	Favorable	400	Blue grama	20
		Normal	250	Scribner needlegrass	20
		Unfavorable	100	True mountainmahogany	15
				Western wheatgrass	5
				Bottlebrush squirreltail	5
				Mountain muhly	5
				Indian ricegrass	5
				Sideoats grama	5
3 Aquic Ustifluvents	Riverbottom #73	Favorable	2,500	Western wheatgrass	25
		Normal	1,500	Inland saltgrass	10
		Unfavorable	500	Alkali sacaton	10
				Sand dropseed	10
				Sedge	10
				Little bluestem	5
				Big bluestem	5
				Plains cottonwood	5
				Tamarisk	5
				Willow	5
4 Aquolls	Mountain Meadow #241	Favorable	3,500	Sedge	40
		Normal	3,000	Tufted hairgrass	25
		Unfavorable	2,000	Slender wheatgrass	10
				Nebraska sedge	10
				Baltic rush	5
6 Bloom	Salt Meadow #30	Favorable	2,500	Alkali sacaton	40
		Normal	2,000	Western wheatgrass	15
		Unfavorable	1,800	Switchgrass	10
				Inland saltgrass	10
				Alkali bluegrass	5
7 Boyle	Pinyon-Juniper	Favorable	500	Blue grama	15
		Normal	400	Mountain muhly	10
		Unfavorable	300	Sedge	10
				Indian ricegrass	10
				Gambel oak	10
				Prairie junegrass	5
				Mountainmahogany	5
				Needleandthread	5
8:					
Boyle	Pinyon-Juniper	Favorable	500	Blue grama	15
		Normal	400	Mountain muhly	10
		Unfavorable	300	Sedge	10
				Indian ricegrass	10
				Gambel oak	10
				Prairie junegrass	5
				Mountainmahogany	5
				Needleandthread	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
8:					
Martinsdale	Mountain Loam, 13-18" PPT #226	Favorable	1,000	Western wheatgrass	25
		Normal	800	Needleandthread	25
		Unfavorable	400	Blue grama	10
				Fringed sagebrush	10
				Prairie junegrass	5
9:					
Boyle	Pinyon-Juniper	Favorable	500	Blue grama	15
		Normal	400	Mountain muhly	10
		Unfavorable	300	Sedge	10
				Indian ricegrass	10
				Gambel oak	10
				Prairie junegrass	5
				Mountainmahogany	5
				Needleandthread	5
Rock outcrop.					
10 Bronell	Gravelly Foothill #214	Favorable	850	Blue grama	10
		Normal	600	Scribner needlegrass	10
		Unfavorable	400	Needleandthread	10
				Pinyon	10
				Sideoats grama	5
				Western wheatgrass	5
				Indian ricegrass	5
				Pinyon ricegrass	5
				Mountainmahogany	5
				Rocky Mountain juniper	5
				Rubber rabbitbrush	5
11:					
Bronell	Gravelly Foothill #214	Favorable	700	Blue grama	10
		Normal	500	Scribner needlegrass	10
		Unfavorable	300	Needleandthread	10
				Pinyon	10
				Sideoats grama	5
				Western wheatgrass	5
				Indian ricegrass	5
				Pinyon ricegrass	5
				Mountainmahogany	5
				Rocky Mountain juniper	5
				Rubber rabbitbrush	5
Kerhayden	Gravelly Foothill #214	Favorable	700	Blue grama	10
		Normal	500	Scribner needlegrass	10
		Unfavorable	300	Needleandthread	10
				Pinyon	10
				Sideoats grama	5
				Western wheatgrass	5
				Indian ricegrass	5
				Pinyon ricegrass	5
				Mountainmahogany	5
				Rocky Mountain juniper	5
				Rubber rabbitbrush	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
12:					
Bronell Variant	Pinyon-Juniper	Favorable	100	Blue grama	15
		Normal	75	Sideoats grama	15
		Unfavorable	50	True mountainmahogany	15
				Scribner needlegrass	10
				Indian ricegrass	5
				Gambel oak	5
				Sedge	5
				Pinyon	5
				Juniper	5
Wesix	Pinyon-Juniper	Favorable	400	Sideoats grama	20
		Normal	200	Blue grama	10
		Unfavorable	100	Scribner needlegrass	10
				Indian ricegrass	5
				Needleandthread	5
				Mountainmahogany	5
				Hairy tridens	5
				Pinyon	5
Rock outcrop.					
13 Bundo	Spruce-Fir	Favorable	100	Elk sedge	10
		Normal	50	Kentucky bluegrass	10
		Unfavorable	25	Common juniper	10
				Kinnikinnick	5
				Lupine	5
				Oregongrape	5
				Snowberry	5
14 Bushvalley	Shallow Loam #230	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Prairie junegrass	10
				Needlegrass	10
				Western wheatgrass	10
				Blue grama	5
				Pine dropseed	5
15:					
Bushvalley	Shallow Loam #230	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Prairie junegrass	10
				Needlegrass	10
				Western wheatgrass	10
				Blue grama	5
				Pine dropseed	5
Whiteman	Ponderosa Pine	Favorable	1,000	Arizona fescue	25
		Normal	800	Mountain muhly	15
		Unfavorable	600	Prairie junegrass	10
				Muttongrass	5
				Parry oatgrass	5
				Gambel oak	5
				Wax currant	5
				Sedge	5
				Ponderosa pine	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
16: Cascajo	Gravel Breaks #64	Favorable	1,000	Sideoats grama	30
		Normal	750	Blue grama	20
		Unfavorable	550	Little bluestem	10
				Indian ricegrass	5
				Needleandthread	5
				Sand dropseed	5
				Western wheatgrass	5
17: Cascajo Variant	Sandy Foothill #210	Favorable	800	Blue grama	25
		Normal	600	Needleandthread	15
		Unfavorable	400	Sand dropseed	10
				Indian ricegrass	10
				Sideoats grama	5
				Buckwheat	5
				Sedge	5
				Rabbitbrush	5
				Western wheatgrass	5
				Prairie junegrass	5
				Bottlebrush squirreltail	5
18:					
Casvare	Pinyon-Juniper	Favorable	300	Scribner needlegrass	30
		Normal	200	Blue grama	20
		Unfavorable	100	Mountainmahogany	15
				Needleandthread	5
				Indian ricegrass	5
				Bottlebrush squirreltail	5
				Sedge	5
				Sideoats grama	5
Teaspoon	Pinyon-Juniper	Favorable	300	Scribner needlegrass	25
		Normal	200	Blue grama	20
		Unfavorable	100	True mountainmahogany	10
				Mountain muhly	5
				Prairie junegrass	5
				Bottlebrush squirreltail	5
				Sedge	5
				Pinyon	5
				Sideoats grama	5
19:					
Cathedral	Pinyon-Juniper	Favorable	700	Scribner needlegrass	20
		Normal	500	Western wheatgrass	10
		Unfavorable	300	Muttongrass	10
				True mountainmahogany	10
				Bottlebrush squirreltail	5
				Mountain muhly	5
				Indian ricegrass	5
Rock outcrop.					
20: Cerrillos	Loamy Foothill #202	Favorable	1,400	Western wheatgrass	30
		Normal	1,200	Blue grama	15
		Unfavorable	800	Prairie junegrass	10
				Needleandthread	10
				Little bluestem	10
				Sedge	5
				Indian ricegrass	5
				Fringed sagebrush	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
21 Chittum	Dry Shallow Loam #232	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	20
		Unfavorable	500	Prairie junegrass	10
				Western wheatgrass	10
				Indian ricegrass	10
				Blue grama	5
22 Coaldale	Pinyon-Juniper	Favorable	300	Blue grama	20
		Normal	200	Scribner needlegrass	20
		Unfavorable	100	Mountainmahogany	15
				Indian ricegrass	5
				Sedge	5
				Needleandthread	5
				Pinyon ricegrass	5
23 Cochetopa	Loamy Park #222	Favorable	2,000	Arizona fescue	25
		Normal	1,500	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	15
				Western wheatgrass	10
				Prairie junegrass	10
				Blue grama	5
24 Corpening	Shallow Foothill #204	Favorable	600	Sideoats grama	15
		Normal	450	Needleandthread	10
		Unfavorable	300	Blue grama	10
				Little bluestem	5
				Western wheatgrass	5
				True mountainmahogany	5
25 Cryoborolls	Aspen	Favorable	1,000	Sedge	10
		Normal	700	Kentucky bluegrass	10
		Unfavorable	500	Common juniper	10
				Nodding bromegrass	5
				Thurber fescue	5
				Lupine	5
				Parry oatgrass	5
26 Cumulic Cryaquolls	Mountain Meadow #241	Favorable	4,000	Tufted hairgrass	40
		Normal	3,000	Sedge	30
		Unfavorable	2,000	Slender wheatgrass	15
				Baltic rush	5
				Showy cinquefoil	5
				Willow	5
27, 28 Curecanti	Loamy Glacial Outwash #291	Favorable	1,000	Arizona fescue	20
		Normal	800	Mountain muhly	10
		Unfavorable	600	Muttongrass	10
				Western wheatgrass	10
				Fringed sagebrush	8
				Gambel oak	7
				Needleandthread	5
				Indian ricegrass	5
				Prairie junegrass	5
				Bottlebrush squirreltail	5
				Elk sedge	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
29 Curecanti Variant	Cobbly Foothill #213	Favorable	1,500	Sideoats grama	15
		Normal	1,250	Big bluestem	10
		Unfavorable	1,000	Little bluestem	10
				Pinyon	10
				Mountainmahogany	5
				Blue grama	5
				Western wheatgrass	5
				Rocky Mountain juniper	5
				Gambel oak	5
				Hairy goldaster	5
				Louisiana sagewort	5
31 Ess	Brushy Mountain Loam #239	Favorable	2,000	Mountain muhly	20
		Normal	1,200	Bottlebrush squirreltail	15
		Unfavorable	900	Nodding bromegrass	10
				Needleandthread	10
				True mountainmahogany	10
				Scribner needlegrass	10
				Blue grama	5
				Gambel oak	5
				Louisiana sagewort	5
				Indian ricegrass	5
32 Ess	Skeletal Loam #377	Favorable	1,250	Arizona fescue	30
		Normal	1,000	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	15
				Prairie junegrass	10
				Blue grama	5
				Needleandthread	5
				Fringed sagebrush	5
33:					
Ess	Skeletal Loam #377	Favorable	1,250	Arizona fescue	30
		Normal	1,000	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	15
				Prairie junegrass	10
				Blue grama	5
				Needleandthread	5
				Fringed sagebrush	5
Bushvalley	Shallow Loam #230	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Prairie junegrass	10
				Needlegrass	10
				Western wheatgrass	10
				Blue grama	5
				Pine dropseed	5
34 Fort Collins	Loamy Plains #6	Favorable	1,200	Blue grama	60
		Normal	800	Sideoats grama	5
		Unfavorable	500	Sand dropseed	5
				Western wheatgrass	5
35, 36 Fort Collins	Loamy Foothill #202	Favorable	1,600	Western wheatgrass	40
		Normal	1,100	Blue grama	30
		Unfavorable	800	Little bluestem	10
				Needleandthread	10
				Sedge	5
				Fourwing saltbush	5
				Sand dropseed	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
37 Fort Collins Variant	Loamy Foothill #202	Favorable	1,500	Western wheatgrass	30
		Normal	1,200	Blue grama	20
		Unfavorable	900	Prairie junegrass	10
				Needleandthread	10
				Little bluestem	5
				Indian ricegrass	5
				Fringed sagebrush	5
				Bottlebrush squirreltail	5
38, 39 Granile	Douglas-Fir	Favorable	150	Common juniper	10
		Normal	100	Oregongrape	5
		Unfavorable	75	Snowberry	5
				Sedge	5
				Kinnikinnick	5
40:					
Granile	Douglas-Fir	Favorable	150	Common juniper	10
		Normal	100	Oregongrape	5
		Unfavorable	75	Snowberry	5
				Sedge	5
				Kinnikinnick	5
Guffey	Douglas-Fir	Favorable	150	Elk sedge	10
		Normal	100	Common juniper	10
		Unfavorable	50	Snowberry	5
				Oregongrape	5
				Kinnikinnick	5
41:					
Haploborolls	Pinyon-Juniper	Favorable	400	Scribner needlegrass	30
		Normal	200	Blue grama	20
		Unfavorable	100	Mountainmahogany	20
				Indian ricegrass	15
				Gambel oak	5
Rock outcrop.					
42 Heath	Loamy Park #222	Favorable	1,800	Arizona fescue	20
		Normal	1,500	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	15
				Western wheatgrass	10
				Slender wheatgrass	5
				Prairie junegrass	5
				Needleandthread	5
43:					
Herakle	Douglas-Fir	Favorable	500	Common juniper	10
		Normal	350	Arizona fescue	5
		Unfavorable	200	Mountain muhly	5
				Currant	5
				Snowberry	5
				Sedge	5
				Kinnikinnick	5
Rock outcrop.					
44 Hodden	Mountain Loam, 10-16" PPT #225	Favorable	950	Mountain muhly	40
		Normal	800	Arizona fescue	15
		Unfavorable	600	Blue grama	15
				Needleandthread	5
				Prairie junegrass	5
				Western wheatgrass	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
45 Hoodle	Loamy Park #222	Favorable	2,000	Arizona fescue	30
		Normal	1,500	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	15
				Prairie junegrass	10
				Western wheatgrass	10
46 Jodero	Loamy Foothill #202	Favorable	1,500	Blue grama	30
		Normal	1,200	Western wheatgrass	20
		Unfavorable	900	Needleandthread	15
				Prairie junegrass	5
				Sideoats grama	5
				Indian ricegrass	5
				Bottlebrush squirreltail	5
47 Jodero Variant	Dry Mountain Swale #280	Favorable	1,600	Western wheatgrass	40
		Normal	1,200	Slender wheatgrass	10
		Unfavorable	900	Needleandthread	10
				Streambank wheatgrass	5
				Blue grama	5
				Bottlebrush squirreltail	5
				Sand dropseed	5
				Fringed sagebrush	5
48, 49 Kim	Loamy Plains #6	Favorable	1,200	Blue grama	50
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Sideoats grama	10
				Sand dropseed	10
50 Kim	Loamy Foothill #202	Favorable	1,300	Blue grama	40
		Normal	1,100	Needleandthread	10
		Unfavorable	800	Western wheatgrass	10
				Prairie junegrass	5
				Sideoats grama	5
51 Kim	Loamy Plains #6	Favorable	1,200	Blue grama	50
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Sideoats grama	10
				Indian ricegrass	5
52:					
Kim	Loamy Plains #6	Favorable	1,200	Blue grama	50
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Sideoats grama	10
				Sand dropseed	10
52:					
Cascajo	Gravel Breaks #64	Favorable	1,000	Sideoats grama	30
		Normal	750	Blue grama	20
		Unfavorable	550	Little bluestem	10
				Indian ricegrass	5
				Needleandthread	5
				Sand dropseed	5
				Western wheatgrass	5
53:					
Kim	Loamy Foothill #202	Favorable	1,300	Blue grama	40
		Normal	1,100	Needleandthread	10
		Unfavorable	800	Western wheatgrass	10
				Prairie junegrass	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
53:					
Shingle	Shaly Foothill #212	Favorable	600	Blue grama	25
		Normal	400	Little bluestem	15
		Unfavorable	350	Sideoats grama	15
				Indian ricegrass	10
				Western wheatgrass	10
				Needleandthread	5
				Pinyon ricegrass	5
54:					
Lakehelen	Douglas-Fir	Favorable	150	Common juniper	15
		Normal	100	Kinnikinnick	5
		Unfavorable	75	Sedge	5
		Unfavorable	75	Oregongrape	5
		Unfavorable	75	Snowberry	5
Rock outcrop.					
55 Larand	Spruce-Fir	Favorable	100	Elk sedge	10
		Normal	75	Common juniper	10
		Unfavorable	50	Nodding bromegrass	5
				Kentucky bluegrass	5
				Kinnikinnick	5
				Lupine	5
				Snowberry	5
				Oregongrape	5
56 Larkson	Ponderosa Pine	Favorable	800	Arizona fescue	25
		Normal	700	Mountain muhly	20
		Unfavorable	500	Gambel oak	15
				Wheatgrass	10
				Pine dropseed	10
				Mountainmahogany	5
				Snowberry	5
57 Libeg	Loamy Glacial Outwash #291	Favorable	1,000	Arizona fescue	20
		Normal	800	Muttongrass	10
		Unfavorable	600	Western wheatgrass	10
				Mountain muhly	10
				Blue grama	5
				Little bluestem	5
				Prairie junegrass	5
				Elk sedge	5
				Lupine	5
				Bottlebrush squirreltail	5
				Gambel oak	5
58 Limon	Salt Flat #34	Favorable	1,500	Alkali sacaton	50
		Normal	1,000	Western wheatgrass	10
		Unfavorable	700	Blue grama	10
				Fourwing saltbush	10
				Inland saltgrass	5
59, 60 Limon	Salt Flat #34	Favorable	1,600	Alkali sacaton	40
		Normal	1,250	Western wheatgrass	20
		Unfavorable	800	Fourwing saltbush	20
				Blue grama	10
				Inland saltgrass	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
61, 62:					
Limon	Salt Flat #34	Favorable	1,500	Alkali sacaton	45
		Normal	800	Blue grama	20
		Unfavorable	500	Western wheatgrass	15
				Fourwing saltbush	10
Gaynor	Shaly Plains #46	Favorable	1,000	Alkali sacaton	40
		Normal	800	Blue grama	25
		Unfavorable	400	Western wheatgrass	15
				Indian ricegrass	5
				Galleta	5
				Fourwing saltbush	5
63:					
Limon	Salt Flat #34	Favorable	1,600	Alkali sacaton	40
		Normal	1,250	Western wheatgrass	20
		Unfavorable	650	Fourwing saltbush	20
				Blue grama	10
				Inland saltgrass	5
Gaynor	Salt Flat #34	Favorable	1,000	Alkali sacaton	40
		Normal	800	Fourwing saltbush	15
		Unfavorable	400	Western wheatgrass	15
				Blue grama	10
				Inland saltgrass	5
				Indian ricegrass	5
64:					
Louviers	Pinyon-Juniper	Favorable	400	Western wheatgrass	30
		Normal	300	Blue grama	25
		Unfavorable	200	Sideoats grama	10
				Scribner needlegrass	10
				Little bluestem	5
				Indian ricegrass	5
				Mountainmahogany	5
Travessilla	Pinyon-Juniper	Favorable	400	Scribner needlegrass	25
		Normal	300	Sideoats grama	15
		Unfavorable	200	Blue grama	10
				Mountainmahogany	10
				Little bluestem	5
				Gambel oak	5
				Pinyon	5
65, 66 Manvel	Loamy Plains #6	Favorable	1,000	Blue grama	50
		Normal	800	Galleta	5
		Unfavorable	500	Winterfat	5
				Sand dropseed	5
				Western wheatgrass	5
67 Manvel	Salt Flat #34	Favorable	1,600	Alkali sacaton	40
		Normal	1,200	Blue grama	20
		Unfavorable	700	Western wheatgrass	20
				Fourwing saltbush	10
				Galleta	5
				Inland saltgrass	5
68 Manzanola	Loamy Plains #6	Favorable	1,000	Blue grama	50
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Galleta	10

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
69 Martinsdale	Mountain Loam, 13-18" PPT #226	Favorable	1,000	Western wheatgrass	25
		Normal	750	Needleandthread	25
		Unfavorable	400	Blue grama	10
				Fringed sagebrush	10
				Prairie junegrass	5
70 Martinsdale Variant	Mountain Loam, 13-18" PPT #226	Favorable	1,000	Western wheatgrass	30
		Normal	750	Needleandthread	25
		Unfavorable	400	Blue grama	10
				Fringed sagebrush	10
				Muttongrass	5
				Prairie junegrass	5
71 Midway	Shaly Plains #46	Favorable	700	Alkali sacaton	50
		Normal	550	Blue grama	20
		Unfavorable	300	Galleta	15
				Western wheatgrass	5
				Sideoats grama	5
72:					
Midway	Gravel Breaks #64	Favorable	1,000	Sideoats grama	30
		Normal	800	Blue grama	25
		Unfavorable	600	Indian ricegrass	10
				Needleandthread	10
				Western wheatgrass	5
				Little bluestem	5
Cascajo	Gravel Breaks #64	Favorable	1,000	Sideoats grama	30
		Normal	750	Blue grama	20
		Unfavorable	550	Little bluestem	10
				Indian ricegrass	5
				Needleandthread	5
				Sand dropseed	5
				Western wheatgrass	5
73 Morset	Mountain Loam, 10-16" PPT #225	Favorable	1,000	Western wheatgrass	40
		Normal	750	Arizona fescue	20
		Unfavorable	500	Needleandthread	10
				Blue grama	10
74:					
Mussel	Loamy Foothill #202	Favorable	1,500	Blue grama	30
		Normal	1,100	Western wheatgrass	20
		Unfavorable	800	Sideoats grama	15
				Needleandthread	15
				Sand dropseed	5
				Bottlebrush squirreltail	5
				Prairie junegrass	5
Bronell	Gravelly Foothill #214	Favorable	850	Blue grama	10
		Normal	600	Scribner needlegrass	10
		Unfavorable	400	Needleandthread	10
				Pinyon	10
				Sideoats grama	5
				Western wheatgrass	5
				Indian ricegrass	5
				Pinyon ricegrass	5
				Mountainmahogany	5
				Rocky Mountain juniper	5
				Rubber rabbitbrush	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
75: Neville	Loamy Foothill #202	Favorable	1,500	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	900	Needleandthread	15
				Prairie junegrass	10
				Indian ricegrass	5
				Sideoats grama	5
76, 77, 78, 79: Nunn	Loamy Foothill #202	Favorable	1,500	Western wheatgrass	35
		Normal	1,200	Blue grama	20
		Unfavorable	900	Prairie junegrass	10
				Little bluestem	10
				Needleandthread	10
				Indian ricegrass	5
				Bottlebrush squirreltail	5
80: Otero	Sandy Plains #26	Favorable	1,400	Blue grama	30
		Normal	1,000	Sideoats grama	10
		Unfavorable	800	Little bluestem	10
				Needleandthread	10
				Sand dropseed	10
				Indian ricegrass	5
				Bottlebrush squirreltail	5
81: Otero	Sandy Foothill #210	Favorable	1,400	Blue grama	20
		Normal	1,100	Sand dropseed	15
		Unfavorable	800	Needleandthread	10
				Indian ricegrass	10
				Western wheatgrass	10
				Sideoats grama	5
				Little bluestem	5
				Bottlebrush squirreltail	5
				Sedge	5
82: Pendant	Pinyon-Juniper	Favorable	400	Sideoats grama	20
		Normal	200	Blue grama	15
		Unfavorable	100	Scribner needlegrass	10
				Mountainmahogany	10
				Indian ricegrass	5
				Needleandthread	5
				Bottlebrush squirreltail	5
				Gambel oak	5
83:					
Penrose	Limestone Breaks #58	Favorable	800	Sideoats grama	25
		Normal	600	Blue grama	20
		Unfavorable	300	Scribner needlegrass	10
				Indian ricegrass	10
				Juniper	5
				Little bluestem	5
Minnequa	Loamy Plains #6	Favorable	1,000	Blue grama	40
		Normal	800	Western wheatgrass	10
		Unfavorable	500	Galleta	5
				Sand dropseed	5
				Winterfat	5
84:					
Penrose	Limestone Breaks #58	Favorable	800	Sideoats grama	25
		Normal	600	Blue grama	20
		Unfavorable	300	Scribner needlegrass	10
				Indian ricegrass	10
				Juniper	5
				Little bluestem	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
84:					
Rock outcrop.					
85 Querida	Sandy Foothill #210	Favorable	800	Blue grama	25
		Normal	600	Needleandthread	15
		Unfavorable	400	Indian ricegrass	10
				Sand dropseed	5
				Bottlebrush squirreltail	5
				Sideoats grama	5
				Prairie junegrass	5
				Sedge	5
				Buckwheat	5
				Rabbitbrush	5
86:					
Raleigh	Ponderosa Pine	Favorable	1,000	Gambel oak	25
		Normal	600	Arizona fescue	10
		Unfavorable	400	Mountain muhly	10
				Muttongrass	10
				Mountainmahogany	5
				Prairie junegrass	5
				Pine dropseed	5
				Sedge	5
Rock outcrop.					
87:					
Redcameron	Pinyon-Juniper	Favorable	300	Blue grama	20
		Normal	200	Scribner needlegrass	20
		Unfavorable	100	True mountainmahogany	15
				Sideoats grama	5
				Indian ricegrass	5
				Sedge	5
				Needleandthread	5
				Pinyon ricegrass	5
Rock outcrop.					
Teaspoon	Pinyon-Juniper	Favorable	300	Scribner needlegrass	25
		Normal	200	Blue grama	20
		Unfavorable	100	True mountainmahogany	10
				Mountain muhly	5
				Prairie junegrass	5
				Bottlebrush squirreltail	5
				Sedge	5
				Pinyon	5
				Sideoats grama	5
88 Rentsac	Pinyon-Juniper	Favorable	300	Blue grama	20
		Normal	150	Scribner needlegrass	20
		Unfavorable	100	True mountainmahogany	15
				Sideoats grama	5
				Indian ricegrass	5
89 Rentsac Variant	Dry Shallow Loam #232	Favorable	900	Arizona fescue	20
		Normal	600	Western wheatgrass	10
		Unfavorable	450	Mountain muhly	10
				Indian ricegrass	10
				Blue grama	10
				Needleandthread	10
				Bottlebrush squirreltail	5
				Winterfat	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
90 Resort	Pinyon-Juniper	Favorable	350	Mountain muhly	20
		Normal	250	True mountainmahogany	15
		Unfavorable	100	Gambel oak	10
				Needleandthread	5
				Blue grama	5
				Rabbitbrush	5
91:					
Resort	Pinyon-Juniper	Favorable	350	Mountain muhly	20
		Normal	250	True mountainmahogany	15
		Unfavorable	100	Gambel oak	10
				Needleandthread	5
				Blue grama	5
				Rabbitbrush	5
Rock outcrop.					
93:					
Rizozo	Pinyon-Juniper	Favorable	400	Sideoats grama	20
		Normal	200	Blue grama	10
		Unfavorable	100	Scribner needlegrass	10
				Pinyon	5
				Indian ricegrass	5
				Needleandthread	5
				Mountainmahogany	5
				Mountain snowberry	5
				Hairy tridens	5
				Rocky Mountain juniper	5
Neville	Loamy Foothill #202	Favorable	1,500	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	900	Needleandthread	15
				Prairie junegrass	10
				Indian ricegrass	5
				Sideoats grama	5
94:					
Rizozo	Pinyon-Juniper	Favorable	400	Sideoats grama	20
		Normal	200	Blue grama	10
		Unfavorable	100	Scribner needlegrass	10
				Pinyon	5
				Indian ricegrass	5
				Needleandthread	5
				Mountainmahogany	5
				Mountain snowberry	5
				Hairy tridens	5
				Rocky Mountain juniper	5
Rock outcrop.					
96 Rogert	Dry Shallow Pine #218	Favorable	800	Mountain muhly	30
		Normal	600	Blue grama	15
		Unfavoarable	400	Arizona fescue	10
				Gambel oak	10
				Muttongrass	5
				Bottlebrush squirreltail	5
				Mountainmahogany	5
				Skunkbush sumac	5
				Pinyon	5
				Pine dropseed	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo-sition
			Lb/acre		Pct
97 Rogert	Shallow Pine #240	Favorable	1,000	Mountain muhly	35
		Normal	800	Arizona fescue	20
		Unfavorable	600	Parry oatgrass	10
				Muttongrass	5
				Prairie junegrass	5
				Wax currant	5
				Hairy goldaster	5
				Mountainmahogany	5
				Gambel oak	5
98 Roygorge	Pinyon-Juniper	Favorable	600	Scribner needlegrass	25
		Normal	400	Gambel oak	10
		Unfavorable	300	True mountainmahogany	10
				Snowberry	10
				Blue grama	5
				Sideoats grama	5
				Sedge	5
				Muttongrass	5
99 Sawfork	Dry Loamy Slopes #227	Favorable	950	Mountain muhly	40
		Normal	800	Arizona fescue	15
		Unfavorable	600	Blue grama	15
				Needleandthread	5
				Prairie junegrass	5
				Western wheatgrass	5
100, 101 Sedillo	Gravelly Foothill #214	Favorable	1,000	Blue grama	10
		Normal	850	Needleandthread	10
		Unfavorable	400	Scribner needlegrass	10
				Pinyon	10
				Little bluestem	5
				Sideoats grama	5
				Western wheatgrass	5
				Indian ricegrass	5
				Pinyon ricegrass	5
				Rocky Mountain juniper	5
102 Seitz	Douglas-Fir	Favorable	300	Mountain muhly	45
		Normal	250	Elk sedge	20
		Unfavorable	200	Kentucky bluegrass	10
				Common juniper	5
				Buffaloberry	5
103:					
Seitz	Ponderosa Pine	Favorable	300	Mountain muhly	45
		Normal	250	Elk sedge	20
		Unfavorable	200	Arizona fescue	15
				Pine dropseed	10
				Prairie junegrass	5
Bushvalley	Shallow Loam #230	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Prairie junegrass	10
				Needlegrass	10
				Western wheatgrass	10
				Blue grama	5
				Pine dropseed	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
104 Shanta	Loamy Foothill #202	Favorable	1,600	Western wheatgrass	35
		Normal	1,300	Blue grama	20
		Unfavorable	900	Needleanthread	10
				Prairie junegrass	10
105 Shanta	Overflow #36	Favorable	1,700	Blue grama	25
		Normal	1,400	Western wheatgrass	20
		Unfavorable	1,000	Little bluestem	10
				Indian ricegrass	10
				Sideoats grama	5
106:					
Shanta	Loamy Foothill #202	Favorable	1,600	Western wheatgrass	35
		Normal	1,300	Blue grama	20
		Unfavorable	900	Needleandthread	10
				Prairie junegrass	10
Nederland	Cobbly Foothill #213	Favorable	1,200	Needleandthread	15
		Normal	1,000	Sideoats grama	10
		Unfavorable	800	Blue grama	10
				Little bluestem	10
				Gambel oak	10
				Mountain muhly	10
				Mountainmahogany	5
				Pinyon	5
				Prairie junegrass	5
				Western wheatgrass	5
107 Shingle	Gravel Breaks #64	Favorable	1,200	Little bluestem	15
		Normal	800	Needleandthread	15
		Unfavorable	600	Sideoats grama	15
				Blue grama	10
				Indian ricegrass	10
				Sand dropseed	5
				Walkingstick cholla	5
				Pricklypear	5
108 Shingle	Shaly Plains #46	Favorable	800	Alkali sacaton	30
		Normal	550	Blue grama	30
		Unfavorable	300	Western wheatgrass	20
				Sideoats grama	10
				Galleta	5
				Indian ricegrass	5
				Needleandthread	5
109 Shrine	Loamy Foothill #202	Favorable	1,500	Blue grama	30
		Normal	1,100	Western wheatgrass	20
		Unfavorable	900	Needleandthread	10
				Little bluestem	10
				Indian ricegrass	10
				Bottlebrush squirreltail	5
				Prairie junegrass	5
				Sideoats grama	5
110:					
Swissvale	Pinyon-Juniper	Favorable	500	Scribner needlegrass	20
		Normal	350	Blue grama	20
		Unfavorable	250	True mountainmahogany	15
				Sideoats grama	5
				Indian ricegrass	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
110:					
Rentsac	Pinyon-Juniper	Favorable	300	Blue grama	20
		Normal	150	Scribner needlegrass	20
		Unfavorable	100	True mountainmahogany	5
				Sideoats grama	5
				Indian ricegrass	5
111 Teaspoon	Pinyon-Juniper	Favorable	300	Scribner needlegrass	25
		Normal	200	Blue grama	20
		Unfavorable	100	True mountainmahogany	10
				Mountain muhly	5
				Prairie junegrass	5
				Bottlebrush squirreltail	5
				Sedge	5
				Pinyon	5
				Sideoats grama	5
112 Tecolote	Ponderosa Pine	Favorable	800	Sedge	15
		Normal	600	Gambel oak	10
		Unfavorable	400	Blue grama	10
				Mountainmahogany	10
				Mountain muhly	10
				Scribner needlegrass	10
				Pine dropseed	5
113 Tecolote	Ponderosa Pine	Favorable	800	Arizona fescue	20
		Normal	500	Gambel oak	10
		Unfavorable	300	Mountain muhly	10
				Oregongrape	5
				Elk sedge	5
				Strawberry	5
				Rocky Mountain juniper	5
				Kinnikinnick	5
				Lupine	5
				Needleandthread	5
114 Tellura	Loamy Park #222	Favorable	1,800	Arizona fescue	20
		Normal	1,500	Parry oatgrass	20
		Unfavorable	800	Mountain muhly	20
				Needleandthread	10
				Prairie junegrass	10
				Slender wheatgrass	5
				Western wheatgrass	5
115 Tolex	Ponderosa Pine	Favorable	500	Sedge	15
		Normal	300	Muttongrass	15
		Unfavorable	200	Snowberry	10
				Gambel oak	10
				Mountainmahogany	10
				Arizona fescue	10
				Blue grama	5
				Pine dropseed	5
116:					
Tolex	Ponderosa Pine	Favorable	900	Sedge	15
		Normal	500	Muttongrass	15
		Unfavorable	300	Snowberry	10
				Gambel oak	10
				Mountainmahogany	10
				Arizona fescue	10
				Blue grama	5
				Pine dropseed	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
116:					
Larkson	Ponderosa Pine	Favorable	800	Arizona fescue	25
		Normal	700	Mountain muhly	20
		Unfavorable	500	Gambel oak	15
				Wheatgrass	10
				Pine dropseed	10
				Mountainmahogany	5
				Snowberry	5
117 Travessilla	Pinyon-Juniper	Favorable	400	Scribner needlegrass	25
		Normal	300	Sideoats grama	15
		Unfavorable	200	Blue grama	10
				Little bluestem	5
				Mountainmahogany	5
				Gambel oak	5
				Pinyon	5
118:					
Travessilla	Pinyon-Juniper	Favorable	400	Scribner needlegrass	25
		Normal	300	Mountainmahogany	10
		Unfavorable	200	Little bluestem	10
				Gambel oak	10
				Sideoats grama	10
				Blue grama	10
				Pinyon	5
				Indian ricegrass	5
Rock outcrop.					
119:					
Troutdale	Mountain Loam, 13-18" PPT #226	Favorable	1,100	Needleandthread	20
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Arizona fescue	10
				Mountain muhly	10
				Indian ricegrass	5
				Prairie junegrass	5
				Fringed sagebrush	5
				Blue grama	5
Rogert	Dry Shallow Pine #218	Favorable	800	Mountain muhly	30
		Normal	600	Blue grama	15
		Unfavorable	400	Arizona fescue	10
				Gambel oak	10
				Muttongrass	5
				Bottlebrush squirreltail	5
				Mountainmahogany	5
				Skunkbush sumac	5
				Pinyon	5
				Pine dropseed	5
120:					
Ustic Torriorthents	Pinyon-Juniper	Favorable	550	Mountainmahogany	30
		Normal	350	Scribner needlegrass	25
		Unfavorable	200	Blue grama	15
				Indian ricegrass	15
				Sand dropseed	5
				Gambel oak	5
Rock outcrop.					

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
121:					
Ustic Torriorthents	Pinyon-Juniper	Favorable	700	Blue grama	35
		Normal	400	Sideoats grama	15
		Unfavorable	250	Needleandthread	10
				Western wheatgrass	10
				Scribner needlegrass	10
				Indian ricegrass	5
				Mountainmahogany	5
				Little bluestem	5
Sedillo	Pinyon-Juniper	Favorable	800	Needleandthread	30
		Normal	500	Sideoats grama	25
		Unfavorable	350	True mountainmahogany	10
				Gambel oak	10
				Blue grama	5
				Scribner needlegrass	5
122 Wages	Loamy Foothill #202	Favorable	1,500	Blue grama	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	800	Needleandthread	20
				Prairie junegrass	5
				Sedge	5
123:					
Wahatoya	Ponderosa Pine	Favorable	600	Arizona fescue	20
		Normal	400	Gambel oak	10
		Unfavorable	300	Mountain muhly	10
				Sedge	10
				Muttongrass	10
				Prairie junegrass	5
				Mountainmahogany	5
				Pine dropseed	5
Tolex	Ponderosa Pine	Favorable	500	Sedge	15
		Normal	300	Muttongrass	15
		Unfavorable	200	Snowberry	10
				Gambel oak	10
				Mountainmahogany	10
				Arizona fescue	10
				Blue grama	5
				Pine dropseed	5
124:					
Wann	Salt Meadow #30	Favorable	3,000	Alkali sacaton	35
		Normal	2,500	Western wheatgrass	30
		Unfavorable	1,800	Switchgrass	20
				Blue grama	10
				Inland saltgrass	5
Shanta	Overflow #36	Favorable	1,700	Blue grama	25
		Normal	1,400	Western wheatgrass	20
		Unfavorable	1,000	Little bluestem	10
				Indian ricegrass	10
				Sideoats grama	5

TABLE 6.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range or woodland site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
125 Wesix	Pinyon-Juniper	Favorable	400	Sideoats grama	20
		Normal	200	Blue grama	10
		Unfavorable	100	Scribner needlegrass	10
				Indian ricegrass	5
				Needleandthread	5
				Mountainmahogany	5
				Hairy tridens	5
				Pinyon	5
126:					
Wetmore	Ponderosa Pine	Favorable	700	Mountainmahogany	20
		Normal	500	Mountain muhly	10
		Unfavorable	300	Arizona fescue	10
				Gambel oak	10
				Pine dropseed	5
				Blue grama	5
Bundo	Douglas-Fir	Favorable	100	Arizona fescue	10
		Normal	50	Kentucky bluegrass	10
		Unfavorable	25	Kinnikinnick	10
				Common juniper	10
				Snowberry	5
Rock outcrop.					
127:					
Wetmore	Ponderosa Pine	Favorable	700	Mountainmahogany	20
		Normal	500	Mountain muhly	10
		Unfavorable	300	Arizona fescue	10
				Gambel oak	8
				Pine dropseed	5
				Blue grama	5
Rock outcrop.					
128 Wiley	Loamy Foothill #202	Favorable	1,600	Western wheatgrass	45
		Normal	1,200	Blue grama	25
		Unfavorable	800	Needleandthread	10
				Prairie junegrass	5
129 Wiley	Loamy Plains #6	Favorable	1,100	Blue grama	60
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Galleta	5
				Needlethread	5
				Bottlebrush squirreltail	5
				Sand dropseed	5
130 Youga	Loamy Park #222	Favorable	2,100	Arizona fescue	20
		Normal	1,500	Mountain muhly	20
		Unfavorable	800	Parry oatgrass	20
				Prairie junegrass	10
				Needleandthread	10
				Western wheatgrass	5
				Slender wheatgrass	5
				Sedge	5

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index
2 Amalia	2R	Severe	Severe	Moderate	Slight	Moderate	Pinyon	55
							Rocky Mountain juniper	---
5 Arents	2R	Moderate	Moderate	Moderate	Slight	Severe	Pinyon	55
							Rocky Mountain juniper	---
7 Boyle	1D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	50
							Rocky Mountain juniper	---
8: Boyle	1D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	50
							Rocky Mountain juniper	---
Martinsdale.								
9: Boyle	1R	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	50
							Rocky Mountain juniper	---
Rock outcrop.								
10 Bronell	1F	Moderate	Moderate	Moderate	Slight	Moderate	Pinyon	45
							Rocky Mountain juniper	---
11: Bronell	1F	Moderate	Moderate	Moderate	Slight	Moderate	Pinyon	45
							Rocky Mountain juniper	---
Kerhayden	1R	Moderate	Moderate	Moderate	Slight	Severe	Pinyon	40
							Rocky Mountain juniper	---
12: Bronell Variant	1X	Severe	Severe	Severe	Slight	Severe	Pinyon	30
							Rocky Mountain juniper	---
							Oneseed juniper	---
Wesix	1D	Slight	Moderate	Moderate	Severe	Moderate	Pinyon	---
							Rocky Mountain juniper	45
							Oneseed juniper	---
Rock outcrop.								
13 Bundo	2F	Severe	Severe	Moderate	Slight	Moderate	Engelmann spruce	30
							Douglas-fir	40
							Lodgepole pine	---
							Limber pine	---
15: Bushvalley.								

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index
15:								
Whiteman----------	2D	Moderate	Moderate	Moderate	Severe	Severe	Ponderosa pine------	40
							Bristlecone pine----	---
18:								
Casvare-----------	1X	Moderate	Severe	Severe	Severe	Moderate	Pinyon--------------	40
							Rocky Mountain juniper------------	---
Teaspoon----------	2R	Slight	Severe	Moderate	Severe	Moderate	Pinyon--------------	55
							Rocky Mountain juniper------------	---
19:								
Cathedral---------	1R	Severe	Severe	Severe	Severe	Severe	Pinyon--------------	30
							Rocky Mountain juniper------------	---
Rock outcrop.								
22----------------- Coaldale	1D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon--------------	45
							Rocky Mountain juniper------------	---
25----------------- Cryoborolls	3F	Moderate	Moderate	Moderate	Slight	Moderate	Quaking aspen-------	70
29----------------- Curecanti Variant	2X	Slight	Severe	Moderate	Slight	Moderate	Pinyon--------------	55
							Rocky Mountain juniper------------	---
38, 39------------- Granile	3F	Slight	Moderate	Severe	Slight	Slight	Douglas-fir---------	55
							White fir-----------	---
40:								
Granile-----------	3F	Slight	Moderate	Severe	Slight	Slight	Douglas-fir---------	55
							White fir-----------	---
Guffey------------	2R	Severe	Moderate	Slight	Moderate	Slight	Douglas-fir---------	45
							White fir-----------	---
41:								
Haploborolls------	1R	Severe	Severe	Severe	Severe	Severe	Pinyon--------------	45
							Rocky Mountain juniper------------	---
Rock outcrop.								
43:								
Herakle-----------	2D	Severe	Moderate	Moderate	Moderate	Slight	Douglas-fir---------	40
							White fir-----------	---
Rock outcrop.								
54:								
Lakehelen---------	3R	Severe	Severe	Severe	Moderate	Moderate	Douglas-fir---------	50
							White fir-----------	---
Rock outcrop.								

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index
55----------------- Larand	2F	Moderate	Moderate	Moderate	Slight	Severe	Engelmann spruce----	40
							Douglas-fir---------	45
							White fir-----------	---
							Lodgepole pine------	---
							Bristlecone pine----	---
56----------------- Larkson	3A	Slight	Slight	Slight	Slight	Moderate	Ponderosa pine------	55
64:								
Louviers----------	1D	Moderate	Severe	Moderate	Severe	Moderate	Pinyon--------------	35
							Rocky Mountain juniper------------	---
Travessilla-------	1D	Moderate	Severe	Moderate	Severe	Moderate	Pinyon--------------	40
							Rocky Mountain juniper------------	---
74: Mussel.								
Bronell-----------	1F	Moderate	Moderate	Moderate	Slight	Moderate	Pinyon--------------	45
							Rocky Mountain juniper------------	---
82----------------- Pendant	1D	Slight	Moderate	Severe	Severe	Moderate	Pinyon--------------	45
							Rocky Mountain juniper------------	40
86:								
Raleigh-----------	2D	Moderate	Moderate	Severe	Moderate	Moderate	Ponderosa pine------	45
Rock outcrop.								
87:								
Redcameron--------	1D	Slight	Moderate	Moderate	Severe	Moderate	Pinyon--------------	40
							Rocky Mountain juniper------------	---
Rock outcrop.								
Teaspoon----------	1R	Slight	Severe	Moderate	Severe	Moderate	Pinyon--------------	50
							Rocky Mountain juniper------------	---
88----------------- Rentsac	1R	Severe	Severe	Moderate	Severe	Slight	Pinyon--------------	40
							Rocky Mountain juniper------------	---
90----------------- Resort	1D	Severe	Severe	Severe	Moderate	Slight	Pinyon--------------	45
							Rocky Mountain juniper------------	---
91:								
Resort------------	1R	Severe	Severe	Severe	Moderate	Slight	Pinyon--------------	40
							Rocky Mountain juniper------------	---
Rock outcrop.								

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index
93:								
Rizozo	1D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	45
							Rocky Mountain juniper	---
Neville.								
94:								
Rizozo	1D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	45
							Rocky Mountain juniper	---
Rock outcrop.								
96, 97 Rogert	2D	Moderate	Moderate	Severe	Severe	Moderate	Ponderosa pine	48
98 Roygorge	2D	Moderate	Moderate	Moderate	Severe	Moderate	Pinyon	60
							Rocky Mountain juniper	---
102 Seitz	2F	Slight	Slight	Slight	Slight	Moderate	Douglas-fir	50
							Engelmann spruce	---
							Lodgepole pine	---
103:								
Seitz	3F	Moderate	Moderate	Moderate	Slight	Moderate	Ponderosa pine	55
Bushvalley.								
110:								
Swissvale	1R	Moderate	Severe	Moderate	Severe	Moderate	Pinyon	50
							Rocky Mountain juniper	---
Rentsac	1R	Severe	Severe	Moderate	Severe	Slight	Pinyon	45
							Rocky Mountain juniper	---
111 Teaspoon	1R	Slight	Severe	Moderate	Severe	Moderate	Pinyon	50
							Rocky Mountain juniper	---
112 Tecolote	2F	Moderate	Moderate	Slight	Slight	Moderate	Ponderosa pine	50
113 Tecolote	3F	Slight	Slight	Moderate	Slight	Moderate	Ponderosa pine	60
							Douglas-fir	---
115 Tolex	3D	Slight	Moderate	Moderate	Severe	Moderate	Ponderosa pine	50
116:								
Tolex	2R	Moderate	Severe	Severe	Severe	Severe	Ponderosa pine	40
Larkson	3X	Moderate	Moderate	Slight	Slight	Moderate	Ponderosa pine	50
117 Travessilla	1D	Moderate	Moderate	Moderate	Severe	Severe	Pinyon	40
							Rocky Mountain juniper	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity	
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index
118:								
Travessilla	1D	Severe	Moderate	Severe	Severe	Severe	Pinyon	40
Rock outcrop.								
119:								
Troutdale.								
Rogert	2D	Moderate	Moderate	Severe	Severe	Moderate	Ponderosa pine	45
120:								
Ustic Torriorthents	1R	Severe	Severe	Severe	Severe	Severe	Pinyon	20
							Rocky Mountain juniper	---
Rock outcrop.								
121:								
Ustic Torriorthents	1X	Slight	Moderate	Moderate	Slight	Moderate	Pinyon	45
							Rocky Mountain juniper	---
Sedillo	1F	Slight	Moderate	Severe	Slight	Moderate	Pinyon	50
							Rocky Mountain juniper	---
123:								
Wahatoya	3R	Moderate	Severe	Moderate	Moderate	Severe	Ponderosa pine	55
Tolex	2R	Moderate	Severe	Severe	Severe	Severe	Ponderosa pine	40
125: Wesix	1D	Slight	Moderate	Moderate	Severe	Moderate	Pinyon	55
							Rocky Mountain juniper	---
126:								
Wetmore	3D	Moderate	Severe	Moderate	Slight	Moderate	Ponderosa pine	35
Bundo	3R	Moderate	Moderate	Slight	Slight	Severe	Douglas-fir	60
							White fir	---
Rock outcrop.								
127:								
Wetmore	2D	Moderate	Severe	Moderate	Slight	Moderate	Ponderosa pine	35
Rock outcrop.								

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1 Adderton	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
2 Amalia	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
3 Aquic Ustifluvents	Severe: flooding, wetness, excess salt.	Severe: excess salt.	Severe: excess salt.	Moderate: wetness.	Severe: excess salt.
4 Aquolls	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
5 Arents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
6 Bloom	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
7 Boyle	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
8:					
Boyle	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Slight	Severe: small stones, depth to rock.
Martinsdale	Slight	Slight	Severe: slope.	Slight	Slight.
9:					
Boyle	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
10 Bronell	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones.
11:					
Bronell	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11:					
Kerhayden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
12:					
Bronell Variant	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, slope.
Wesix	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
13 Bundo	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, large stones, slope.
14 Bushvalley	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
15:					
Bushvalley	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Whiteman	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: large stones, slope, depth to rock.
16 Cascajo	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
17 Cascajo Variant	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: droughty.
18:					
Casvare	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, droughty.
Teaspoon	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
19:					
Cathedral	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
19:					
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
20 Cerrillos	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
21 Chittum	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
22 Coaldale	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
23 Cochetopa	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
24 Corpening	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
25 Cryoborolls	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
26 Cumulic Cryaquolls	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
27 Curecanti	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.
28 Curecanti	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
29 Curecanti Variant	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones.
30 Dumps and Pits	Variable	Variable	Variable	Variable	Variable.
31, 32 Ess	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
33:					
Ess	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Bushvalley	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
34-------------------- Fort Collins	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
35-------------------- Fort Collins	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
36-------------------- Fort Collins	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
37-------------------- Fort Collins Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight----------	Slight.
38-------------------- Granile	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
39-------------------- Granile	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
40:					
Granile--------------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
Guffey---------------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
41:					
Haploborolls---------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty.
Rock outcrop---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
42-------------------- Heath	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
43:					
Herakle--------------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, thin layer.
Rock outcrop---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
44-------------------- Hodden	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight----------	Severe: small stones, droughty.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
45-------------------- Hoodle	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Severe: small stones.
46-------------------- Jodero	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
47-------------------- Jodero Variant	Severe: flooding.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight----------	Slight.
48-------------------- Kim	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
49, 50---------------- Kim	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
51-------------------- Kim	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
52:					
Kim------------------	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
Cascajo--------------	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty.
53:					
Kim------------------	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
Shingle--------------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight----------	Severe: depth to rock.
54:					
Lakehelen------------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty.
Rock outcrop---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
55-------------------- Larand	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
56-------------------- Larkson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, slope.
57-------------------- Libeg	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, small stones.	Severe: small stones, large stones, droughty.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
58 Limon	Severe: flooding.	Moderate: excess salt.	Moderate: excess salt.	Slight	Moderate: excess salt.
59 Limon	Slight	Slight	Slight	Slight	Slight.
60 Limon	Severe: flooding.	Slight	Slight	Slight	Slight.
61:					
Limon	Slight	Slight	Slight	Slight	Slight.
Gaynor	Slight	Slight	Slight	Slight	Moderate: depth to rock.
62:					
Limon	Slight	Slight	Severe: slope.	Slight	Slight.
Gaynor	Slight	Slight	Severe: slope.	Slight	Moderate: depth to rock.
63:					
Limon	Slight	Slight	Slight	Slight	Slight.
Gaynor	Slight	Slight	Slight	Slight	Moderate: depth to rock.
64:					
Louviers	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Travessilla	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
65 Manvel	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Slight.
66 Manvel	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
67 Manvel	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Slight	Severe: excess salt.
68 Manzanola	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
69 Martinsdale	Slight	Slight	Severe: slope.	Slight	Slight.
70 Martinsdale Variant	Slight	Slight	Moderate: slope.	Slight	Slight.
71 Midway	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
72:					
Midway	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, large stones, slope.
Cascajo	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
73 Morset	Slight	Slight	Moderate: slope.	Slight	Slight.
74:					
Mussel	Slight	Slight	Severe: slope.	Slight	Slight.
Bronell	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones.
75 Neville	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
76 Nunn	Moderate: dusty.	Moderate: dusty.	Moderate: large stones, slope.	Moderate: dusty.	Moderate: large stones.
77 Nunn	Moderate: dusty.	Moderate: dusty.	Moderate: slope.	Moderate: dusty.	Slight.
78 Nunn	Slight	Slight	Slight	Slight	Slight.
79 Nunn	Slight	Slight	Moderate: slope.	Slight	Slight.
80 Otero	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
81 Otero	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
82 Pendant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, depth to rock.
83:					
Penrose	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: dusty.	Severe: depth to rock.
Minnequa	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Slight	Moderate: slope, depth to rock.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
84:					
Penrose	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
85 Querida	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
86:					
Raleigh	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
87:					
Redcameron	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
Teaspoon	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, slope.
88 Rentsac	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock.	Severe: small stones, slope, depth to rock.
89 Rentsac Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
90 Resort	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
91:					
Resort	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
92 Riverwash	Severe: flooding, small stones, wetness.	Severe: wetness, too sandy, small stones.	Severe: small stones, too sandy, wetness.	Severe: wetness, too sandy, small stones.	Severe: small stones, wetness, droughty.
93:					
Rizozo	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope, dusty.	Severe: slope, depth to rock.
Neville	Slight	Slight	Severe: slope.	Slight	Slight.
94:					
Rizozo	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope, dusty.	Severe: slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
95 Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
96, 97 Rogert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
98 Roygorge	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
99 Sawfork	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, slope.
100 Sedillo	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Moderate: small stones, large stones.
101 Sedillo	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones.
102 Seitz	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
103:					
Seitz	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope.
Bushvalley	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
104, 105: Shanta	Severe: flooding.	Slight	Slight	Slight	Slight.
106:					
Shanta	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
Nederland	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, large stones, droughty.
107: Shingle	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
108: Shingle	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: dusty.	Severe: depth to rock.
109: Shrine	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
110:					
Swissvale	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
Rentsac	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope.
111: Teaspoon	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
112: Tecolote	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
113: Tecolote	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: small stones, large stones.
114: Tellura	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
115: Tolex	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
116:					
Tolex	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope.
Larkson	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
117 Travessilla	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight	Severe: depth to rock.
118:					
Travessilla	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
119:					
Troutdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
Rogert	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, droughty.
120:					
Ustic Torriorthents	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, droughty.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
121:					
Ustic Torriorthents	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, depth to rock.
121:					
Sedillo	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.	Severe: small stones, large stones, droughty.
122 Wages	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
123:					
Wahatoya	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Tolex	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope.
124:					
Wann	Severe: flooding, wetness.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
Shanta	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
125 Wesix	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: small stones, slope, depth to rock.
126:					
Wetmore	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, depth to rock.
Bundo	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
127:					
Wetmore	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
128, 129 Wiley	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
130 Youga	Slight	Slight	Severe: slope.	Slight	Moderate: large stones, droughty.

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1------------------ Adderton	Poor	Poor	Good	---	Good	Poor	Very poor.	Poor	---	Very poor.	Good.
2------------------ Amalia	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
3------------------ Aquic Ustifluvents	Poor	Fair	Good	---	Good	Poor	Poor	Fair	Good	Poor	Good.
4------------------ Aquolls	Very poor.	Poor	Poor	---	Poor	Good	Poor	Poor	---	Fair	Poor.
5------------------ Arents	Very poor.	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
6------------------ Bloom	Fair	Good	Good	---	Fair	Good	Good	Good	---	Good	Fair.
7------------------ Boyle	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
8:											
Boyle-------------	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Martinsdale-------	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
9:											
Boyle-------------	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
10----------------- Bronell	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
11:											
Bronell-----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Kerhayden---------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
12:											
Bronell Variant---	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Wesix-------------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor	Very poor.	Very poor.	Poor.
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
13----------------- Bundo	Very poor.	Very poor.	Good	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
14----------------- Bushvalley	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
15:											
Bushvalley--------	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Whiteman----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
16----------------- Cascajo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
17----------------- Cascajo Variant	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
18:											
Casvare-----------	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Teaspoon----------	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
19:											
Cathedral---------	Very poor.	Very poor.	Poor	Very poor	Poor	Very poor.	Very poor.	Poor	Very poor	Very poor.	---
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
20----------------- Cerrillos	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
21----------------- Chittum	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
22----------------- Coaldale	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
23----------------- Cochetopa	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
24----------------- Corpening	Very poor.	Very poor.	Poor	---	Poor	Very poor	Very poor	Very poor.	---	Very poor	Poor.
25----------------- Cryoborolls	Very poor.	Very poor.	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
26----------------- Cumulic Cryaquolls	Poor	Poor	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
27, 28------------- Curecanti	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
29----------------- Curecanti Variant	Very poor.	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
30----------------- Dumps and Pits	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
31, 32 Ess	Very poor.	Very poor.	Good	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
33:											
Ess	Very poor.	Very poor.	Good	Good	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Bushvalley	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
34, 35, 36 Fort Collins	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
37 Fort Collins Variant	Poor	Fair	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
38, 39 Granile	Poor	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
40:											
Granile	Poor	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Guffey	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
41:											
Haploborolls	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
42 Heath	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
43:											
Herakle	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
44 Hodden	Poor	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
45 Hoodle	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
46 Jodero	Good	Good	Good	---	Good	Poor	Very poor.	Good	---	Poor	Good.
47 Jodero Variant	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
48, 49 Kim	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
50 Kim	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
51 Kim	Good	Good	---	---	Fair	Poor	Poor	Good	---	Poor	---
52:											
Kim	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Cascajo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
53:											
Kim	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Shingle	Poor	Poor	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
54:											
Lakehelen	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
55 Larand	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
56 Larkson	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	---
57 Libeg	Very poor.	Very poor.	Very poor.	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
58 Limon	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
59, 60 Limon	Fair	Fair	Fair	---	Fair	Fair	Poor	Fair	---	Poor	Fair.
61:											
Limon	Poor	Poor	Fair	---	Fair	Poor	Poor	Poor	---	Poor	Fair.
Gaynor	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
62:											
Limon	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Gaynor	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
63:											
Limon	Fair	Fair	Fair	---	Fair	Fair	Poor	Fair	---	Poor	Fair.
Gaynor	Poor	Poor	Fair	---	Fair	Very poor.	Poor	Poor	---	Poor	Fair.
64:											
Louviers	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
64:											
Travessilla	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
65, 66 Manvel	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
67 Manvel	Poor	Poor	Poor	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
68 Manzanola	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
69 Martinsdale	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
70 Martinsdale Variant	Poor	Fair	Good	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
71 Midway	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
72:											
Midway	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Cascajo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
73 Morset	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
74:											
Mussel	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Bronell	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
75 Neville	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
76, 77 Nunn	Poor	Fair	Fair	---	Good	Poor	Very poor.	Fair	---	Poor	Fair.
78 Nunn	Fair	Good	Good	---	Good	Fair	Very poor.	Good	---	Poor	Good.
79 Nunn	Poor	Fair	Fair	---	Good	Poor	Very poor.	Fair	---	Poor	Fair.
80, 81 Otero	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
82 Pendant	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
83:											
Penrose	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
83:											
Minnequa	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
84:											
Penrose	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
85 Querida	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
86:											
Raleigh	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
87:											
Redcameron	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Teaspoon	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
88 Rentsac	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
89 Rentsac Variant	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
90 Resort	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
91:											
Resort	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
92 Riverwash	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.
93:											
Rizozo	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Neville	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
94:											
Rizozo	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
94:											
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
95 Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
96, 97 Rogert	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
98 Roygorge	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
99 Sawfork	Poor	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
100, 101 Sedillo	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
102 Seitz	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
103:											
Seitz	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Bushvalley	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
104, 105 Shanta	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
106:											
Shanta	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Nederland	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
107 Shingle	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
108 Shingle	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
109 Shrine	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
110:											
Swissvale	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Rentsac	Very poor.	Very poor.	Poor	Very poor	Poor	Very poor.	Very poor.	Very poor.	Very poor	Very poor.	---
111 Teaspoon	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
112, 113 Tecolote	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
114------- Tellura	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
115------- Tolex	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
116:											
Tolex-------	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Larkson-------	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	---
117------- Travessilla	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
118:											
Travessilla-------	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor	---
Rock outcrop-------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
119:											
Troutdale-------	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Rogert-------	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
120:											
Ustic Torriorthents-------	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Rock outcrop-------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
121:											
Ustic Torriorthents-------	Very poor.	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Sedillo-------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
122------- Wages	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
123:											
Wahatoya-------	Very poor.	Very poor.	Poor	Very poor.	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Tolex-------	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
124:											
Wann-------	Fair	Good	Good	---	Good	Fair	Fair	Good	---	Fair	Good.
Shanta-------	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
125----------------Wesix	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
126:											
Wetmore------------	Very poor.	Very poor.	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Bundo--------------	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rock outcrop-------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
127:											
Wetmore------------	Very poor.	Very poor.	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Rock outcrop-------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
128, 129-----------Wiley	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
130----------------Youga	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1 Adderton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
2 Amalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
3 Aquic Ustifluvents	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: excess salt.
4 Aquolls	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
5 Arents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
6 Bloom	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
7 Boyle	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.
8:						
Boyle	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: small stones, depth to rock.
Martinsdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
9:						
Boyle	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
10 Bronell	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: small stones, large stones.
11:						
Bronell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11:						
Kerhayden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
12:						
Bronell Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.
Wesix	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
13 Bundo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.
14 Bushvalley	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
15:						
Bushvalley	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Whiteman	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.
16 Cascajo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
17 Cascajo Variant	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
18:						
Casvare	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, droughty.
Teaspoon	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
19:						
Cathedral	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
19:						
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
20 Cerrillos	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.
21 Chittum	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
22 Coaldale	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
23 Cochetopa	Moderate: too clayey.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
24 Corpening	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
25 Cryoborolls	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
26 Cumulic Cryaquolls	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
27 Curecanti	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: small stones, droughty.
28 Curecanti	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, slope.
29 Curecanti Variant	Moderate: depth to rock, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, large stones.	Severe: large stones.
30 Dumps and Pits	Variable	Variable	Variable	Variable	Variable	Variable.
31, 32 Ess	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
33:						
Ess	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Bushvalley	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
34, 35, 36-------- Fort Collins	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
37---------------- Fort Collins Variant	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
38---------------- Granile	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
39---------------- Granile	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
40:						
Granile----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Guffey-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
41:						
Haploborolls-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
42---------------- Heath	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: large stones, slope.
43:						
Herakle----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
44---------------- Hodden	Severe: cutbanks cave, large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: small stones, droughty.
45---------------- Hoodle	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: droughty.
46---------------- Jodero	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
47---------------- Jodero Variant	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, low strength, flooding.	Slight.
48---------------- Kim	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight*.
49---------------- Kim	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight*.
50---------------- Kim	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight*.
51**:------------- Kim	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength.	Slight*.
52:						
Kim--------------	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight*.
Cascajo----------	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: small stones, droughty.
53:						
Kim--------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength.	Moderate*: slope.
Shingle----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
54:						
Lakehelen--------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
55---------------- Larand	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
56---------------- Larkson	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: large stones, slope.
57---------------- Libeg	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, droughty.
58---------------- Limon	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Moderate*: excess salt.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
59**: Limon	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight*.
60**: Limon	Moderate: too clayey, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight*.
61, 62:						
Limon	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight*.
Gaynor	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate*: depth to rock.
63**:						
Limon	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight*.
Gaynor	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate*: wetness, depth to rock.
64:						
Louviers	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope.	Severe: small stones, slope.
Travessilla	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
65: Manvel	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.	Slight*.
66: Manvel	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength.	Slight*.
67: Manvel	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.	Severe*: excess salt.
68: Manzanola	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
69: Martinsdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
70: Martinsdale Variant	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
71: Midway	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: depth to rock.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
72:						
Midway	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: small stones, large stones, slope.
Cascajo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
73 Morset	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
74:						
Mussel	Slight	Slight	Slight	Moderate: slope.	Slight	Slight*.
Bronell	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: small stones, large stones.
75 Neville	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight*.
76 Nunn	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: large stones.
77, 78 Nunn	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
79 Nunn	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80 Otero	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate*: droughty.
81 Otero	Slight	Slight	Slight	Moderate: slope.	Slight	Slight*.
82 Pendant	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, large stones, depth to rock.
83:						
Penrose	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Minnequa	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: low strength.	Moderate*: slope, depth to rock.
84:						
Penrose	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
84:						
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
85 Querida	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate*: small stones, droughty.
86:						
Raleigh	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
87:						
Redcameron	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
Teaspoon	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, large stones, slope.
88 Rentsac	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
89 Rentsac Variant	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
90 Resort	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
91:						
Resort	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
92 Riverwash	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: small stones, wetness, droughty.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
93:						
Rizozo-----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Neville----------	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
94:						
Rizozo-----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
95--------------- Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
96, 97------------ Rogert	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
98--------------- Roygorge	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
99--------------- Sawfork	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
100--------------- Sedillo	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: small stones, large stones.
101--------------- Sedillo	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones.
102--------------- Seitz	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
103:						
Seitz------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Bushvalley-------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
104, 105---------- Shanta	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight*.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
106:						
Shanta	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight*.
Nederland	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, droughty.
107 Shingle	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
108 Shingle	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: low strength.	Severe: depth to rock.
109 Shrine	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength.	Slight*.
110:						
Swissvale	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
Rentsac	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
111 Teaspoon	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
112 Tecolote	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
113 Tecolote	Moderate: large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Severe: small stones, large stones.
114 Tellura	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: small stones, large stones, slope.
115 Tolex	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
116:						
Tolex	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
116:						
Larkson	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
117 Travessilla	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
118:						
Travessilla	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
119:						
Troutdale	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
Rogert	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, droughty.
120:						
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
121:						
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.
Sedillo	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, droughty.
122 Wages	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
123:						
Wahatoya	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.

See footnotes at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
123:						
Tolex	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope.
124:						
Wann	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate*: wetness, flooding.
Shanta	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight*.
125 Wesix	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
126:						
Wetmore	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
Bundo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
127:						
Wetmore	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
128 Wiley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength.	Slight*.
129 Wiley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.	Slight*.
130 Youga	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: small stones, droughty.

* Rating criteria do not include consideration of alkaline soil reaction in the surface layer and the upper part of the root zone. Landscaping species should be adapted to moderately alkaline soils.

** Wetness is caused by a high water table during the irrigation season. Depth to the high water table and the severity of wetness are variable.

TABLE 11.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1-------------------- Adderton	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight------------	Fair: too clayey, small stones, thin layer.
2-------------------- Amalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
3-------------------- Aquic Ustifluvents	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
4-------------------- Aquolls	Severe: flooding, wetness.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
5-------------------- Arents	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
6-------------------- Bloom	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
7-------------------- Boyle	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, small stones, slope.
8:					
Boyle---------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock, small stones.
Martinsdale---------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight------------	Fair*: too clayey.
9:					
Boyle---------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, small stones, slope.
Rock outcrop--------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
10------------------- Bronell	Moderate: slope, large stones.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11:					
Bronell	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
Kerhayden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
12:					
Bronell Variant	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Wesix	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
13 Bundo	Severe: slope.	Severe: seepage, slope, large stones.	Severe: slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
14 Bushvalley	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
15:					
Bushvalley	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Whiteman	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
16 Cascajo	Severe: poor filter, slope.	Severe: seepage, slope, large stones.	Severe: slope, too sandy, large stones.	Severe: slope.	Poor: seepage, too sandy, small stones.
17 Cascajo Variant	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
18:					
Casvare	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
18:					
Teaspoon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
19:					
Cathedral	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
20 Cerrillos	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Fair: small stones.
21 Chittum	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
22 Coaldale	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, small stones, slope.
23 Cochetopa	Severe: percs slowly, poor filter.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
24 Corpening	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
25 Cryoborolls	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
26 Cumulic Cryaquolls	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
27 Curecanti	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
28 Curecanti	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
29 Curecanti Variant	Severe: percs slowly.	Severe: slope, large stones.	Severe: depth to rock, large stones.	Moderate: slope.	Poor: small stones.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
30. Dumps and Pits	Variable	Variable	Variable	Variable	Variable.
31, 32. Ess	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: small stones, slope.
33:					
Ess	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: small stones, slope.
Bushvalley	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
34. Fort Collins	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
35. Fort Collins	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good*.
36. Fort Collins	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
37. Fort Collins Variant	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
38. Granile	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: small stones.
39. Granile	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
40:					
Granile	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
Guffey	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
41:					
Haploborolls	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
41:					
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
42 Heath	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
43:					
Herakle	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
44 Hodden	Severe: large stones.	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: seepage, small stones.
45 Hoodle	Moderate: slope, large stones.	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
46 Jodero	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: small stones, thin layer.
47 Jodero Variant	Severe: percs slowly.	Moderate: slope.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair*: too clayey.
48 Kim	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good*.
49, 50 Kim	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
51** Kim	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Fair*: too clayey.
52:					
Kim	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
Cascajo	Severe: poor filter.	Severe: seepage, slope, large stones.	Severe: too sandy, large stones.	Moderate: slope.	Poor: seepage, too sandy, small stones.
53:					
Kim	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair*: slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
53:					
Shingle	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
54:					
Lakehelen	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
55 Larand	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
56 Larkson	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
57 Libeg	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
58 Limon	Severe: percs slowly.	Slight	Moderate: flooding.	Moderate: flooding.	Good*.
59**: Limon	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Moderate: wetness.	Good*.
60**: Limon	Severe: wetness, percs slowly.	Slight	Severe: flooding, wetness.	Moderate: flooding, wetness.	Good*.
61:					
Limon	Severe: percs slowly.	Moderate: depth to rock.	Severe: depth to rock.	Slight	Good*.
Gaynor	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
62:					
Limon	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Slight	Good*.
Gaynor	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Slight	Poor: depth to rock.
63**:					
Limon	Severe: wetness, percs slowly.	Slight	Moderate: wetness.	Moderate: wetness.	Good*.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
63**:					
Gaynor-------------	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Moderate: wetness.	Poor: depth to rock.
64:					
Louviers-----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Travessilla--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
65------------------ Manvel	Moderate: percs slowly.	Moderate: seepage.	Slight-----------	Slight-----------	Good*.
66------------------ Manvel	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----------	Slight-----------	Good*.
67------------------ Manvel	Moderate: percs slowly.	Moderate: slope, seepage.	Severe: excess salt.	Slight-----------	Good*.
68------------------ Manzanola	Severe: percs slowly.	Moderate: slope.	Slight-----------	Slight-----------	Good*.
69------------------ Martinsdale	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair*: too clayey.
70------------------ Martinsdale Variant	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good*.
71------------------ Midway	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
72:					
Midway-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Cascajo------------	Severe: poor filter, slope.	Severe: seepage, slope, large stones.	Severe: slope, too sandy, large stones.	Severe: slope.	Poor: seepage, too sandy, small stones.
73------------------ Morset	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Fair*: small stones.
74:					
Mussel-------------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good*.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
74:					
Bronell	Moderate: slope, large stones.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.
75 Neville	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
76, 77 Nunn	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
78 Nunn	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good*.
79 Nunn	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
80, 81 Otero	Slight	Severe: seepage.	Slight	Slight	Fair*. too sandy.
82 Pendant	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
83:					
Penrose	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
Minnequa	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
84:					
Penrose	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
85 Querida	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair*: small stones.
86:					
Raleigh	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
87:					
Redcameron	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
Teaspoon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
88: Rentsac	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: depth to rock, small stones, slope.
89: Rentsac Variant	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
90: Resort	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, too sandy.
91:					
Resort	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, too sandy.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
92: Riverwash	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, small stones, wetness.
93:					
Rizozo	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Neville	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good*.
94:					
Rizozo	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
95------------------ Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
96, 97-------------- Rogert	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
98------------------ Roygorge	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
99------------------ Sawfork	Severe: slope.	Severe: slope, large stones.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
100----------------- Sedillo	Moderate: slope, large stones.	Severe: seepage, slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: small stones.
101----------------- Sedillo	Moderate: large stones.	Severe: seepage, large stones.	Severe: large stones.	Slight-----------	Poor: small stones.
102----------------- Seitz	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
103:					
Seitz---------------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Bushvalley----------	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
104, 105------------ Shanta	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair*: small stones.
106:					
Shanta--------------	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair*: small stones.
Nederland-----------	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: seepage, small stones, slope.
107----------------- Shingle	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
108: Shingle	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
109: Shrine	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair*: too clayey, small stones.
110:					
Swissvale	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rentsac	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: depth to rock, small stones, slope.
111: Teaspoon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
112: Tecolote	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
113: Tecolote	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
114: Tellura	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
115: Tolex	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
116:					
Tolex	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
Larkson	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
117: Travessilla	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
118:					
Travessilla	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
118:					
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
119:					
Troutdale	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Rogert	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, seepage, small stones.
120:					
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
121:					
Ustic Torriorthents	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Sedillo	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
122 Wages	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good*.
123:					
Wahatoya	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Tolex	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
124:					
Wann	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
Shanta	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair*: small stones.

See footnotes at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
125----------------- Wesix	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
126:					
Wetmore------------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
Bundo--------------	Severe: poor filter, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Rock outcrop-------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
127:					
Wetmore------------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
Rock outcrop-------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
128, 129------------ Wiley	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good*.
130----------------- Youga	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Poor: small stones.

* The soil to a depth of 60 inches or more is mostly moderately alkaline. The moderately alkaline reaction class is a limitation for some plant species. The species selected for seeding should be adapted to moderate alkalinity.

** Wetness is caused by a high water table during the irrigation season. Depth to the high water table and the severity of wetness are variable.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1----------------------- Adderton	Good	Probable	Probable	Poor: small stones, area reclaim.
2----------------------- Amalia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
3----------------------- Aquic Ustifluvents	Fair: wetness.	Probable	Probable	Poor: area reclaim.
4----------------------- Aquolls	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
5----------------------- Arents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
6----------------------- Bloom	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
7----------------------- Boyle	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
8:				
Boyle	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Martinsdale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair*: too clayey, small stones.
9:				
Boyle	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
10----------------------- Bronell	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11:				
Bronell	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Kerhayden	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
12:				
Bronell Variant	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Wesix	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
13 Bundo	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
14 Bushvalley	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
15:				
Bushvalley	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Whiteman	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
16 Cascajo	Poor: slope.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
17 Cascajo Variant	Good	Probable	Probable	Poor: small stones, area reclaim.
18:				
Casvare	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
18:				
Teaspoon	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
19:				
Cathedral	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
20 Cerrillos	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
21 Chittum	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
22 Coaldale	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
23 Cochetopa	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
24 Corpening	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
25 Cryoborolls	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
26 Cumulic Cryaquolls	Poor: wetness.	Improbable**: excess fines.	Improbable**: excess fines.	Poor: small stones, wetness.
27 Curecanti	Poor:	Improbable: large stones.	Improbable: large stones.	Poor: small stones.
28 Curecanti	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
29 Curecanti Variant	Fair: depth to rock, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30. Dumps and Pits	Variable	Variable	Variable	Variable.
31, 32. Ess	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
33:				
Ess	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Bushvalley	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
34, 35, 36. Fort Collins	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
37. Fort Collins Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Good*.
38. Granile	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
39. Granile	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
40:				
Granile	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Guffey	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
41:				
Haploborolls	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
42. Heath	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
43:				
Herakle	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
44 Hodden	Poor: large stones.	Probable	Probable	Poor: small stones, area reclaim.
45 Hoodle	Fair: large stones.	Probable	Probable	Poor: area reclaim, small stones.
46 Jodero	Good	Probable	Probable	Poor: area reclaim.
47 Jodero Variant	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair*: too clayey.
48, 49 Kim	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
50 Kim	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
51 Kim	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good*.
52:				
Kim	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
Cascajo	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
53:				
Kim	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
Shingle	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
54:				
Lakehelen	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
55-------------------- Larand	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
56-------------------- Larkson	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
57-------------------- Libeg	Poor: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
58-------------------- Limon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
59, 60---------------- Limon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
61, 62:				
Limon----------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gaynor---------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
63:				
Limon----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gaynor---------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
64:				
Louviers-------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Travessilla----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
65, 66---------------- Manvel	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
67-------------------- Manvel	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
68-------------------- Manzanola	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
69: Martinsdale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair*. too clayey, small stones.
70: Martinsdale Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
71: Midway	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
72:				
Midway	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Cascajo	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
73: Morset	Good	Improbable: excess fines.	Improbable: excess fines.	Fair*: small stones, area reclaim.
74:				
Mussel	Good	Improbable: excess fines.	Improbable: excess fines.	Fair*: small stones.
Bronell	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
75: Neville	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
76, 77, 78, 79: Nunn	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
80, 81: Otero	Good	Improbable: excess fines.	Improbable: excess fines.	Good*.
82: Pendant	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
83:				
Penrose	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Minnequa	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair*: depth to rock, too clayey, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
84:				
Penrose	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
85 Querida	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
86:				
Raleigh	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
87:				
Redcameron	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
Teaspoon	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
88 Rentsac	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
89 Rentsac Variant	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
90 Resort	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
91:				
Resort	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
91:				
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
92 Riverwash	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
93:				
Rizozo	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Neville	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good*.
94:				
Rizozo	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor depth to rock, slope.
95 Rock outcrop	Poor: depth to rock.	---	---	Poor: depth to rock.
96, 97 Rogert	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
98 Roygorge	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
99 Sawfork	Fair: depth to rock, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
100, 101 Sedillo	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
102 Seitz	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
103:				
Seitz	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
103: Bushvalley	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
104, 105 Shanta	Good	Probable	Probable	Poor: small stones, area reclaim.
106: Shanta	Good	Probable	Probable	Poor: area reclaim.
Nederland	Poor: large stones, slope.	Improbable: large stones.	Improbable: large stones.	Poor: area reclaim, slope.
107 Shingle	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
108 Shingle	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
109 Shrine	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair*: small stones.
110: Swissvale	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rentsac	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
111 Teaspoon	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
112 Tecolote	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
113 Tecolote	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
114 Tellura	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
115------------------ Tolex	Poor: depth to rock, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
116:				
Tolex----------------	Poor: depth to rock, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
Larkson--------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
117------------------ Travessilla	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
118:				
Travessilla----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop---------	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
119:				
Troutdale------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Rogert---------------	Poor: depth to rock.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones.
120:				
Ustic Torriorthents--	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop---------	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
121:				
Ustic Torriorthents--	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Sedillo--------------	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
122------------------ Wages	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair*: area reclaim.

See footnotes at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
123:				
Wahatoya	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Tolex	Poor: depth to rock, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
124:				
Wann	Fair: wetness.	Improbable: small stones.	Probable	Poor: area reclaim.
Shanta	Good	Probable	Probable	Poor: area reclaim.
125 Wesix	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
126:				
Wetmore	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
Bundo	Poor: slope.	Improbable: small stones.	Improbable: thin layer.	Poor: small stones, area reclaim, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
127:				
Wetmore	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
128, 129 Wiley	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair*: too clayey.
130 Youga	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

* The soil to a depth of 60 inches or more is mostly moderately alkaline. The moderately alkaline reaction class is a limitation for some plant species. The species selected should be adapted to moderate alkalinity. In some areas the soil may contain an excessive amount of carbonates.

** In some areas the lower part of the substratum is made up of sand, gravel, and cobbles. However, the soils in these areas support mountain meadows that provide hay for livestock and a riparian habitat that is important to various wildlife species.

TABLE 13.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1: Adderton	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
2: Amalia	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, droughty.	Slope	Too arid, slope, droughty.
3: Aquic Ustifluvents	Severe: seepage.	Severe: piping, wetness.	Moderate: cutbanks cave.	Flooding, excess salt, frost action.	Wetness	Wetness	Wetness, excess salt.
4: Aquolls	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, soil blowing, flooding.	Wetness	Wetness.
5: Arents	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, droughty, complex slopes.	Slope, large stones, complex slopes.	Too arid, large stones, slope.
6: Bloom	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, flooding, excess salt.	Erodes easily, wetness.	Wetness, excess salt, erodes easily.
7: Boyle	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Too arid, slope, droughty.
8:							
Boyle	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Too arid, slope, droughty.
Martinsdale	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Erodes easily, soil blowing.	Erodes easily.
Boyle	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Too arid, slope, droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
9:							
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
10 Bronell	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
11:							
Bronell	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Kerhayden	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope, too arid.
12:							
Bronell Variant	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Wesix	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
13 Bundo	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
14 Bushvalley	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
15:							
Bushvalley	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Whiteman	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
16: Cascajo	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
17: Cascajo Variant	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty, too arid.
18:							
Casvare	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Teaspoon	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
19:							
Cathedral	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
20: Cerrillos	Moderate. seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope	Favorable	Too arid, erodes easily.
21: Chittum	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
22: Coaldale	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Too arid, large stones, slope.
23: Cochetopa	Slight: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Percs slowly	Percs slowly.
24: Corpening	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
25: Cryoborolls	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
26: Cumulic Cryaquolls	Moderate: seepage, slope.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action, slope.	Wetness, slope, flooding.	Wetness	Wetness.
27: Curecanti	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Large stones	Large stones, droughty.
28: Curecanti	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
29: Curecanti Variant	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Too arid, large stones, slope.
30: Dumps and Pits	Variable	Variable	Variable	Variable	Variable	Variable	Variable.
31, 32: Ess	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
33: Ess	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
33: Bushvalley	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
34, 35: Fort Collins	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Too arid.
36: Fort Collins	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
37: Fort Collins Variant	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
38, 39: Granile	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope	Slope	Slope, droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
40:							
Granile	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope	Slope	Slope, droughty.
Guffey	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Slope, droughty.
41:							
Haploborolls	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, depth to rock.	Slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
42 Heath	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
43:							
Herakle	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
44 Hodden	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Large stones	Large stones, droughty.
45 Hoodle	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
46 Jodero	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
47 Jodero Variant	Slight	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
48 Kim	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Too arid.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
49: Kim	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
50: Kim	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
51: Kim	Moderate: seepage.	Severe: piping.	Moderate*: deep to water, slow refill.	Deep to water	Wetness*	Wetness*	Too arid.
52:							
Kim	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
Cascajo	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
53:							
Kim	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Too arid, slope.
Shingle	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, depth to rock.
54:							
Lakehelen	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
55: Larand	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
56: Larkson	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
57: Libeg	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
58: Limon	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly	Percs slowly	Too arid, excess salt, percs slowly.
59, 60: Limon	Slight	Moderate*: hard to pack, wetness.	Moderate*: deep to water, slow refill.	Percs slowly, deep to water.	Wetness*, percs slowly.	Wetness*, percs slowly.	Too arid, excess salt, percs slowly.
61:							
Limon	Moderate: depth to rock.	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly	Percs slowly	Too arid, percs slowly.
Gaynor	Moderate: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Percs slowly	Depth to rock, percs slowly.	Too arid, percs slowly, depth to rock.
62:							
Limon	Moderate: depth to rock, slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Percs slowly	Too arid, percs slowly.
Gaynor	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Depth to rock, percs slowly.	Too arid, percs slowly, depth to rock.
63:							
Limon	Slight	Moderate*: hard to pack, wetness.	Moderate*: deep to water, slow refill.	Percs slowly, deep to water.	Wetness*, percs slowly.	Wetness*, percs slowly.	Too arid, excess salt, percs slowly.
Gaynor	Moderate: depth to rock.	Severe: thin layer.	Severe: depth to rock.	Percs slowly, depth to rock, deep to water.	Wetness*, percs slowly, depth to rock.	Depth to rock, wetness*, percs slowly.	Too arid, excess salt, depth to rock.
64:							
Louviers	Severe: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Too arid, slope.
Travessilla	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Too arid, slope, depth to rock.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
65: Manvel	Moderate: seepage**.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Too arid, erodes easily.
66: Manvel	Moderate: slope, seepage**.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Too arid, erodes easily.
67: Manvel	Moderate: seepage**, slope.	Severe: piping, excess salt.	Severe: no water.	Deep to water	Excess salt	Erodes easily	Excess salt, erodes easily, too arid.
68: Manzanola	Moderate: slope.	Slight	Severe: no water.	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly, too arid.
69: Martinsdale	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Erodes easily, soil blowing.	Erodes easily.
70: Martinsdale Variant	Severe: seepage.	Slight	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
71: Midway	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, depth to rock.	Too arid, slope, depth to rock.
72:							
Midway	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Too arid, large stones, slope.
Cascajo	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
73: Morset	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
74:							
Mussel	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Too arid.
Bronell	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
75: Neville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing	Too arid.
76, 77: Nunn	Moderate: seepage**, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Percs slowly	Too arid, percs slowly.
78: Nunn	Moderate: seepage**.	Severe: thin layer.	Severe: no water.	Deep to water	Percs slowly	Percs slowly	Too arid, percs slowly.
79: Nunn	Moderate: seepage**, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Percs slowly	Too arid, percs slowly.
80: Otero	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Soil blowing	Too arid, droughty.
81: Otero	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Soil blowing	Too arid.
82: Pendant	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
83:							
Penrose	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Too arid, slope, depth to rock.
Minnequa	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
84:							
Penrose	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Too arid, slope, depth to rock.
84:							
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
85: Querida	Severe: seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Favorable	Droughty.
86:							
Raleigh	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
87:							
Redcameron	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Teaspoon	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
88: Rentsac	Severe: depth to rock, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Too arid, large stones, slope.
89: Rentsac Variant	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
90: Resort	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
91:							
Resort	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
92: Riverwash	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Large stones, wetness, too sandy.	Large stones, wetness, droughty.
93:							
Rizozo	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Neville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing	Too arid.
94:							
Rizozo	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
95: Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
96, 97: Rogert	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
98: Roygorge	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
99: Sawfork	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
100: Sedillo	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Too arid, large stones, slope.
101: Sedillo	Severe: seepage.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Large stones	Too arid, large stones.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
102: Seitz	Severe: slope.	Moderate: large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
103:							
Seitz	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Bushvalley	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
104, 105: Shanta	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily, too arid.
106:							
Shanta	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily, too arid.
Nederland	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Too arid, large stones, slope.
107: Shingle	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, depth to rock.
108: Shingle	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, depth to rock.
109: Shrine	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
110:							
Swissvale	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Too arid, large stones, slope.
Rentsac	Severe: depth to rock, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Too arid, large stones, slope.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
111: Teaspoon	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
112, 113: Tecolote	Severe: seepage, slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
114: Tellura	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly, large stones.	Slope, droughty, percs slowly.
115: Tolex	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, depth to rock.	Slope, droughty.
116:							
Tolex	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Larkson	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
117: Travessilla	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Too arid, slope, depth to rock.
118:							
Travessilla	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty.	Slope, depth to rock, erodes easily.	Too arid, slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
119:							
Troutdale	Severe: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Rogert	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
120:							
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Too arid, large stones, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
121:							
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Too arid, slope, depth to rock.
Sedillo	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Too arid, large stones, slope.
122 Wages	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Too arid.
123:							
Wahatoya	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Tolex	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
124:							
Wann	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding	Wetness, flooding.	Wetness, soil blowing.	Wetness.
Shanta	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
125 Wesix	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnotes at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
126:							
Wetmore----------	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Bundo------------	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
127:							
Wetmore----------	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
128, 129---------- Wiley	Moderate: seepage**, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Too arid, erodes easily.
130--------------- Youga	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.

* Wetness is caused by a high water table during the irrigation season. Depth to the high water table and the severity of wetness are variable.

** Permeability of the substratum is variable. In some areas seepage is not expected to be a limitation.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------------- Adderton	0-3	Loam-------------	CL-ML, CL, GM-GC, GC	A-4, A-6	0-5	60-100	55-100	45-95	35-75	20-35	5-15
	3-49	Loam, clay loam, silty clay loam.	CL-ML, CL, GM-GC, GC	A-4, A-6	0-5	60-100	55-100	45-95	35-85	20-35	5-15
	49-60	Very gravelly loamy sand.	GM, GP-GM, SM, SP-SM	A-1	0-15	40-60	30-50	15-35	5-15	---	NP
2---------------- Amalia	0-4	Very gravelly loam.	GM-GC	A-2	0-15	40-50	35-45	30-45	20-30	25-35	5-10
	4-13	Very gravelly clay loam, very gravelly sandy clay loam, gravelly clay loam.	GC	A-2	0-15	35-55	25-45	20-45	10-35	30-40	10-20
	13-75	Very gravelly sandy loam, very gravelly loam, gravelly loam.	GP-GC, GM-GC	A-2, A-1	0-25	35-55	25-45	15-35	10-25	20-30	5-10
3---------------- Aquic Ustifluvents	0-13	Loam-------------	CL-ML	A-4	0	95-100	80-100	70-85	50-60	25-30	5-10
	13-40	Stratified fine sandy loam to loam.	SM-SC, SC, CL-ML, CL, SM, ML	A-4, A-2	0	95-100	90-100	55-75	30-60	20-30	NP-10
	40-60	Very gravelly sand, extremely gravelly coarse sand.	GP	A-1	0-10	25-55	20-40	10-30	0-5	---	NP
4---------------- Aquolls	0-23	Fine sandy loam	SM	A-2, A-4	0-10	90-100	80-100	45-85	25-45	20-30	NP-5
	23-60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A-1, A-2, A-4	0-10	70-100	60-100	40-85	20-45	20-30	NP-5
5---------------- Arents	0-11	Shaly loam-------	CL-ML, CL, SM-SC, SC	A-4, A-6	0-10	60-95	55-85	45-85	35-70	15-30	5-15
	11-60	Variable---------	CL, CL-ML, SM-SC, SC	A-2, A-4, A-6	0-35	35-90	30-80	15-80	5-65	15-40	5-20
6---------------- Bloom	0-3	Loam-------------	CL-ML	A-4	0-10	95-100	95-100	90-100	70-90	25-30	5-10
	3-49	Silt loam, silty clay loam.	CL	A-6	0-10	95-100	95-100	95-100	85-95	30-40	10-20
	49-60	Extremely gravelly sand.	GP	A-1	0-10	20-40	10-25	5-20	0-5	---	NP
7---------------- Boyle	0-3	Very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0-25	40-55	35-50	25-40	10-20	15-30	NP-10
	3-17	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	SM-SC, GM-GC, SC, GC	A-2, A-1	0-30	55-90	20-60	15-35	15-25	15-25	5-15
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
8:											
Boyle	0-6	Very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0-5	40-55	35-50	25-40	10-20	15-30	NP-10
	6-17	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	SM-SC, GM-GC, SC, GC	A-2, A-1	0-10	55-90	20-60	15-35	15-25	15-25	5-15
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
Martinsdale	0-5	Sandy loam	CL-ML, ML, SM-SC, SM	A-2, A-4	0-5	95-100	90-100	50-80	25-55	20-30	NP-10
	5-15	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0-5	85-100	80-100	60-80	40-70	30-40	10-15
	15-45	Sandy clay loam, clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	85-100	80-100	60-80	40-70	25-40	5-15
	45-60	Gravelly sandy loam, gravelly sandy clay loam, very gravelly loam.	SM, GM	A-4, A-2, A-1	0-10	45-80	35-70	25-60	15-50	25-35	NP-10
9:											
Boyle	0-3	Very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0-25	40-55	35-50	25-40	10-20	15-30	NP-10
	3-17	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	SM-SC, GM-GC, SC, GC	A-2, A-1	0-30	55-90	20-60	15-35	15-25	15-25	5-15
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10 Bronell	0-16	Gravelly sandy loam.	GM, GM-GC, SM-SC, SM	A-1, A-2	0-15	55-95	50-85	30-60	15-35	20-30	NP-10
	16-60	Extremely gravelly sandy loam, very gravelly sandy loam.	GP, GP-GM, GM, GM-GC	A-1, A-2	0-30	20-60	10-50	5-35	0-20	20-30	NP-10
11:											
Bronell	0-6	Very gravelly loam.	GM-GC	A-2	0-25	30-60	25-50	20-45	15-35	20-30	5-10
	6-40	Very gravelly sandy clay loam, extremely gravelly sandy clay loam, very gravelly sandy loam.	GP, GP-GC, GM-GC	A-2	0-30	20-55	10-45	5-25	0-20	20-30	5-10
	40-60	Extremely gravelly sandy loam, very gravelly sandy loam.	GP, GP-GM, GM, GM-GC	A-1, A-2	0-30	20-60	10-50	5-35	0-20	20-30	NP-10

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
11: Kerhayden-------	0-8	Gravelly sandy loam.	SM	A-1, A-2	0-5	65-95	60-90	40-65	20-35	20-25	NP-5
	8-44	Sandy clay loam, gravelly sandy clay loam, gravelly loam.	SM-SC, SC	A-2, A-4, A-6	0-5	65-95	60-90	45-75	20-50	25-40	5-15
	44-60	Extremely gravelly sandy loam, very gravelly sandy loam.	GM, GP-GM	A-1	0-5	25-55	20-45	10-30	5-20	20-25	NP-5
12: Bronell Variant-	0-3	Very stony loam	GM-GC, GC	A-2, A-4, A-6	35-50	35-70	30-60	25-55	15-45	20-35	5-15
	3-60	Very cobbly loam	GM-GC, GC	A-2, A-4, A-6	35-45	45-70	40-65	35-60	25-50	20-35	5-15
Wesix-----------	0-3	Very channery loam.	GM	A-2, A-4	10-20	45-70	40-60	35-55	25-40	20-30	NP-5
	3-13	Very channery loam, very gravelly loam.	GM	A-2, A-4	10-20	45-70	40-55	35-50	25-40	20-30	NP-5
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
13--------------- Bundo	0-27	Very cobbly sandy loam.	SM-SC, GM-GC	A-2, A-4	35-40	55-75	45-60	25-50	15-40	20-25	5-10
	27-60	Very cobbly sandy loam, very cobbly sandy clay loam, extremely cobbly sandy clay loam.	SM-SC, GM-GC	A-2	40-55	50-80	40-65	25-55	10-35	25-30	5-10
14--------------- Bushvalley	0-4	Cobbly loam------	CL-ML, SM-SC	A-4	20-25	80-90	75-85	65-80	45-60	20-30	5-10
	4-11	Very cobbly sandy clay loam, very cobbly clay loam, extremely cobbly clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-4, A-6	35-55	60-80	55-75	50-70	25-50	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
15: Bushvalley------	0-3	Cobbly loam------	CL-ML, SM-SC	A-4	20-25	80-90	75-85	65-80	45-60	20-30	5-10
	3-12	Very cobbly sandy clay loam, very cobbly clay loam, extremely cobbly clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-4, A-6	35-55	60-80	55-75	50-70	25-50	25-35	5-15
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
15:											
Whiteman--------	0-2	Cobbly loam------	SM-SC, CL-ML	A-4	15-40	75-100	70-90	60-85	40-70	20-25	5-10
	2-11	Very gravelly loam, very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2, A-6	10-25	45-75	35-65	25-55	15-45	20-35	10-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
16--------------- Cascajo	0-6	Very gravelly sandy loam.	GM	A-1	0-15	35-60	30-50	15-35	10-20	20-30	NP-5
	6-21	Extremely cobbly sandy loam, very cobbly sandy loam.	GM, SM	A-1	45-55	35-65	30-55	15-40	10-25	---	NP
	21-60	Extremely cobbly sand, very cobbly sand, extremely cobbly loamy sand.	GP, SP, GP-GM, SP-SM	A-1	45-55	35-65	30-55	15-40	0-15	---	NP
17--------------- Cascajo Variant	0-6	Gravelly sandy loam.	SM	A-1	0	70-90	50-70	30-50	15-25	---	NP
	6-60	Very gravelly loamy sand, very gravelly loamy fine sand, very gravelly sand.	SP, SP-SM, SM	A-1	0	55-75	30-50	15-40	0-15	---	NP
18:											
Casvare---------	0-3	Very stony loam	GM-GC	A-1, A-2	15-40	35-65	30-55	25-50	20-30	20-30	5-10
	3-17	Extremely gravelly sandy loam, extremely channery loam, very gravelly sandy loam.	GP-GC, GM-GC	A-1, A-2	0-15	25-55	20-45	15-40	5-30	20-30	5-10
	17-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Teaspoon--------	0-3	Very gravelly sandy loam.	GM	A-1	0-10	40-60	30-50	20-40	10-25	20-30	NP-5
	3-11	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	GM-GC, GC	A-2	0-30	25-50	15-40	10-35	5-20	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
19:											
Cathedral	0-6	Very gravelly coarse sandy loam.	SM	A-1	0-20	60-85	35-50	25-35	10-20	15-20	NP-5
	6-19	Very gravelly sandy loam, extremely gravelly sandy loam.	GP-GM, SP-SM, SM, GM	A-1	0-30	20-75	15-50	15-35	5-20	15-20	NP-5
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20 Cerrillos	0-10	Gravelly sandy loam.	SM-SC	A-2	0	90-100	55-70	35-50	15-25	20-25	5-10
	10-31	Sandy clay loam, gravelly sandy clay loam.	SC	A-2, A-6	0	90-100	70-90	60-80	30-40	25-30	10-15
	31-39	Gravelly sandy loam.	SM-SC	A-2	0	90-100	55-70	35-50	15-25	20-25	5-10
	39-60	Silt loam	CL-ML	A-4	0	95-100	85-100	75-95	65-85	25-30	5-10
21 Chittum	0-4	Sandy loam	ML, SM	A-4	0-5	80-100	80-100	50-80	30-60	20-25	NP-5
	4-10	Gravelly loam, loam, sandy clay loam.	SC, CL, GC	A-6	0-5	70-95	55-90	55-70	35-55	25-40	10-20
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
22 Coaldale	0-3	Very gravelly sandy loam.	GM, SM	A-1	0-20	45-65	35-55	20-40	10-25	20-25	NP-5
	3-10	Very gravelly sandy clay loam, very gravelly clay loam.	GC, GM-GC	A-1, A-2	0-20	40-65	30-55	25-50	10-35	25-35	5-15
	10-18	Very gravelly sandy loam.	GM, SM	A-1	0-20	40-65	30-55	20-40	10-25	20-25	NP-5
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
23 Cochetopa	0-5	Clay loam	CL	A-6	0-5	90-100	80-100	60-80	50-70	30-35	10-15
	5-32	Clay, clay loam, gravelly clay loam.	CL, CH	A-7	0-5	85-100	75-90	65-85	60-80	40-55	15-30
	32-60	Loam, gravelly loam, clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-5	75-95	70-90	60-80	40-65	25-35	5-15
24 Corpening	0-4	Gravelly loam	GM-GC, SM-SC	A-4	0-5	50-75	50-75	45-65	35-50	20-30	5-10
	4-12	Channery loam, gravelly loam.	GM-GC, SM-SC	A-4	0-5	50-75	50-75	45-65	35-50	20-30	5-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
25--------------- Cryoborolls	0-3	Gravelly loam----	GM-GC, CL-ML	A-4	0-25	60-95	55-90	45-80	35-65	20-25	5-10
	3-11	Very gravelly fine sandy loam, gravelly loam.	GM, GM-GC, ML, CL-ML	A-1, A-2, A-4	0-25	35-85	25-75	15-70	10-55	20-30	NP-10
	11-22	Very gravelly fine sandy loam.	GM, GM-GC	A-1, A-2	10-25	35-70	25-55	15-50	10-25	20-30	NP-10
	22-37	Very gravelly sandy clay loam, extremely gravelly sandy clay loam, gravelly clay loam.	GP-GC, GM-GC, GC	A-2, A-4, A-6	10-30	25-70	15-60	10-55	5-45	25-40	5-15
	37-60	Very cobbly sandy loam, very cobbly loamy sand, extremely cobbly sandy loam.	GP-GM, GM, GM-GC, SM-SC	A-1, A-2	40-65	40-90	30-75	10-50	5-30	20-30	NP-10
26--------------- Cumulic Cryaquolls	0-10	Clay loam--------	CL, SC	A-6	0	85-100	75-100	45-100	45-90	30-35	10-15
	10-25	Stratified clay loam to sandy clay loam.	CL, CL-ML, SC, SM-SC	A-2, A-4, A-6	0	85-100	75-100	50-90	30-70	25-35	5-15
	25-60	Stratified clay loam to gravelly sandy loam.	CL, CL-ML, SM, SM-SC	A-2, A-4, A-6	0-10	70-90	65-85	50-75	30-60	20-35	NP-15
27--------------- Curecanti	0-10	Gravelly sandy loam.	SM, GM	A-1, A-2	5-15	60-85	50-75	30-50	15-30	20-30	NP-5
	10-28	Very cobbly clay loam, very cobbly sandy clay loam, extremely gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2, A-6, A-4	30-60	55-75	40-65	30-60	15-45	25-40	5-15
	28-60	Extremely cobbly sandy loam, very cobbly sandy loam.	SM, GM	A-1	30-70	40-75	35-65	20-45	10-25	20-30	NP-5
28--------------- Curecanti	0-6	Very cobbly sandy loam.	---	---	30-50	55-75	45-65	20-40	10-25	20-30	NP-5
	6-20	Very cobbly clay loam, very cobbly sandy clay loam, extremely gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2, A-6, A-4	30-60	55-75	40-65	30-60	15-45	25-40	5-15
	20-60	Extremely cobbly sandy loam, very cobbly sandy loam.	SM, GM	A-1	30-70	40-75	35-65	20-45	10-25	20-30	NP-5

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29---------------- Curecanti Variant	0-8	Extremely cobbly loam.	GM-GC, SM-SC	A-4, A-2	45-55	60-70	50-60	40-55	30-45	25-30	5-10
	8-18	Very cobbly clay loam, very cobbly clay.	GC	A-6, A-7	30-40	60-70	50-60	45-55	40-50	35-45	15-25
	18-50	Very cobbly loam, very cobbly clay loam.	GC, SC	A-6	20-35	60-75	55-70	45-65	40-50	30-40	10-15
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30---------------- Dumps and Pits	0-60	Variable---------	---	---	---	---	---	---	---	---	---
31---------------- Ess	0-12	Very gravelly sandy clay loam.	GM-GC	A-1, A-2, A-4	10-30	40-70	35-60	25-55	10-45	20-30	5-10
	12-40	Very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-1, A-2, A-4, A-6	10-30	40-70	35-60	25-55	10-45	25-40	5-15
	40-60	Very gravelly sandy loam.	GM-GC, GM	A-1, A-2, A-4	0-25	40-70	35-60	20-55	10-45	20-30	NP-10
32---------------- Ess	0-14	Very gravelly loam.	GM-GC	A-1, A-2, A-4	10-30	40-70	35-60	25-55	10-45	20-30	5-10
	14-33	Very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-1, A-2, A-4, A-6	10-30	40-70	35-60	25-55	10-45	25-40	5-15
	33-40	Extremely cobbly sandy clay loam, very cobbly clay loam.	GM-GC, GC, SM-SC, SC	A-1, A-2, A-4, A-6	45-75	45-75	40-65	30-60	15-50	25-40	5-15
	40-60	Extremely cobbly sandy loam, very cobbly sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	45-75	45-75	40-65	25-45	10-25	20-30	NP-10
33:											
Ess--------------	0-14	Very gravelly loam.	GM-GC	A-1, A-2, A-4	10-30	40-70	35-60	25-55	10-45	20-30	5-10
	14-33	Very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-1, A-2, A-4, A-6	10-30	40-70	35-60	25-55	10-45	25-40	5-15
	33-40	Extremely cobbly sandy clay loam, very cobbly clay loam.	GM-GC, GC, SM-SC, SC	A-1, A-2, A-4, A-6	45-75	45-75	40-65	30-60	15-50	25-40	5-15
	40-60	Extremely cobbly sandy loam, very cobbly sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	45-75	45-75	40-65	25-45	10-25	20-30	NP-10

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
33:											
Bushvalley------	0-4	Cobbly loam------	CL-ML, SM-SC	A-4	20-25	80-90	75-85	65-80	45-60	20-30	5-10
	4-11	Very cobbly sandy clay loam, very cobbly clay loam, extremely cobbly clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-4, A-6	35-55	60-80	55-75	50-70	25-50	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
34, 35, 36------- Fort Collins	0-4	Loam-------------	ML	A-4	0	95-100	90-100	85-100	50-65	20-30	NP-5
	4-21	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	60-75	25-40	10-20
	21-60	Loam, silt loam, fine sandy loam.	CL-ML, ML	A-4	0	95-100	90-100	80-95	50-75	20-30	NP-10
37--------------- Fort Collins Variant	0-4	Loam-------------	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-75	25-35	5-15
	4-13	Clay loam, loam	CL	A-6	0	85-100	80-100	75-100	60-80	30-40	10-20
	13-60	Loam-------------	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-75	20-35	5-15
38--------------- Granile	0-10	Very gravelly sandy loam.	GM, SM	A-1	0-30	35-65	30-55	20-45	10-25	20-25	NP-5
	10-22	Very gravelly clay loam, extremely gravelly sandy clay loam.	GC, SC	A-2	0-15	30-65	20-50	15-45	10-35	25-40	10-20
	22-60	Very gravelly sandy loam, extremely gravelly coarse sandy loam, extremely gravelly loamy coarse sand.	GM, SM, GM-GC, SM-SC	A-1, A-2	0-5	30-60	20-50	10-40	5-20	15-25	NP-10
39--------------- Granile	0-19	Very gravelly sandy loam.	GM, SM	A-1	0-30	35-65	30-55	20-45	10-25	20-25	NP-5
	19-60	Very gravelly clay loam, extremely gravelly sandy clay loam.	GC, SC	A-2	0-15	30-65	20-50	15-45	10-35	25-40	10-20
40:											
Granile---------	0-10	Very gravelly sandy loam.	GM, SM	A-1	0-30	35-65	30-55	20-45	10-25	20-25	NP-5
	10-22	Very gravelly clay loam, extremely gravelly sandy clay loam.	GC, SC	A-2	0-15	30-65	20-50	15-45	10-35	25-40	10-20
	22-60	Very gravelly sandy loam, extremely gravelly coarse sandy loam, extremely gravelly loamy coarse sand.	GM, SM, GM-GC, SM-SC	A-1, A-2	0-5	30-60	20-50	10-40	5-20	15-25	NP-10

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
40:											
Guffey----------	0-13	Very gravelly sandy loam.	SM, SP-SM, GM, GP-GM	A-1	0-30	40-70	30-55	20-35	10-20	20-25	NP-5
	13-23	Extremely gravelly sandy clay loam, very gravelly sandy clay loam.	GC, GP-GC, SC, SP-SC	A-1, A-2	0-5	50-80	15-30	5-25	5-15	25-35	5-15
	23-30	Extremely gravelly coarse sandy loam, very gravelly sandy loam.	GP-GM, SP-SM	A-1	0-5	50-70	15-40	5-30	5-15	20-25	NP-5
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
41:											
Haploborolls----	0-7	Extremely gravelly sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	0-30	30-65	25-55	15-40	10-20	20-30	NP-10
	7-12	Very gravelly sandy loam, extremely gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-1, A-2	0-15	30-65	25-55	15-40	10-20	20-30	NP-10
	12-21	Weathered bedrock	---	---	---	---	---	---	---	---	---
	21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42-------------- Heath	0-7	Cobbly loam------	CL, CL-ML, SC, SM-SC	A-4, A-6	15-35	80-90	75-85	65-80	40-65	25-35	5-15
	7-32	Clay, clay loam	CH, CL	A-7	0-5	80-100	75-100	65-100	50-95	40-65	20-45
	32-60	Clay------------	CH	A-7	0-5	80-100	75-100	70-100	55-95	50-65	30-45
43:											
Herakle---------	0-7	Very channery loam.	GM-GC	A-2, A-4	0-15	40-60	35-55	30-50	20-40	25-30	5-10
	7-13	Extremely channery clay loam, very channery clay loam, extremely gravelly clay loam.	GC	A-2, A-6	0-15	35-60	25-55	20-55	20-45	30-40	10-15
	13-17	Very channery loam, very channery fine sandy loam, extremely gravelly loam.	GM-GC	A-2	5-20	35-50	25-45	20-45	10-35	25-30	5-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
44-------------- Hodden	0-4	Gravelly loam----	GM-GC, CL-ML, ML, GM	A-2, A-4	0-25	40-85	40-75	35-70	25-60	20-30	5-15
	4-16	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6	10-25	40-70	35-60	25-55	10-45	25-35	5-15
	16-44	Very gravelly sandy loam, extremely gravelly sandy loam.	GP, GP-GM, GM, GM-GC	A-1	10-45	15-65	10-55	5-40	0-20	20-30	NP-10
	44-60	Extremely gravelly loamy sand.	GP	A-1	10-30	10-40	5-25	0-20	0-5	20-25	NP-5
45-------------- Hoodle	0-10	Loam-------------	ML, CL-ML	A-4	0-5	85-100	80-100	75-95	55-75	20-30	NP-10
	10-60	Very cobbly sandy clay loam, extremely gravelly sandy clay loam, very gravelly loam, very gravelly clay loam.	GC, GM-GC	A-2, A-6, A-4	10-50	35-65	25-50	20-45	10-40	25-40	5-20
46-------------- Jodero	0-10	Sandy loam-------	SM	A-4	0	90-100	85-100	60-80	35-50	20-25	NP-5
	10-45	Sandy clay loam, loam, gravelly sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0-5	75-95	70-90	55-75	30-60	25-35	5-15
	45-60	Very gravelly loamy sand.	GP-GM	A-1	0-5	40-55	35-45	20-40	5-10	---	NP
47-------------- Jodero Variant	0-12	Clay loam--------	CL, SC	A-6	0	80-100	75-100	65-100	45-80	30-35	10-15
	12-60	Loam, clay loam, silty clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	80-100	75-100	65-100	45-95	20-40	5-20
48, 49----------- Kim	0-3	Loam-------------	ML, CL-ML, SM-SC, SM	A-4	0-5	80-100	75-100	60-90	55-75	20-30	NP-10
	3-60	Loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	75-100	50-95	35-85	20-40	5-15
50-------------- Kim	0-3	Loam-------------	CL-ML	A-4	0-5	75-100	75-100	60-90	50-75	20-30	5-10
	3-60	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	75-100	75-100	65-95	50-80	30-45	5-20
51-------------- Kim	0-4	Loam-------------	CL-ML, CL	A-4	0-5	95-100	90-100	75-100	55-90	20-30	5-10
	4-60	Loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	75-100	55-85	25-35	5-15
52: Kim-------------	0-4	Loam-------------	ML, CL-ML, SM-SC, SM	A-4	0-5	80-100	75-100	60-90	55-75	20-30	NP-10
	4-60	Loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	75-100	50-95	35-85	20-40	5-15

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
52:											
Cascajo	0-6	Very gravelly sandy loam.	GM	A-1	0-15	35-60	30-50	15-35	10-20	20-30	NP-5
	6-21	Extremely cobbly sandy loam, very cobbly sandy loam.	GM, SM	A-1	45-55	35-65	30-55	15-40	10-25	---	NP
	21-60	Extremely cobbly sand, very cobbly sand, extremely cobbly loamy sand.	GP, SP, GP-GM, SP-SM	A-1	45-55	35-65	30-55	15-40	0-15	---	NP
53:											
Kim	0-3	Loam	CL-ML	A-4	0-5	75-100	75-100	60-90	50-75	20-30	5-10
	3-60	Loam, fine sandy loam, clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	75-100	50-85	35-70	20-35	5-15
Shingle	0-4	Loam	CL-ML	A-4	0-5	80-100	80-100	70-95	50-75	20-25	5-10
	4-12	Loam, clay loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	90-100	90-100	70-100	40-80	25-35	5-15
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
54:											
Lakehelen	0-5	Very gravelly fine sandy loam.	GM-GC, GC	A-2	5-30	55-65	45-55	30-50	20-35	25-30	5-10
	5-15	Extremely gravelly sandy loam.	SM, GM	A-1	5-25	40-75	25-45	15-40	10-20	20-30	NP-5
	15-23	Extremely gravelly loam, extremely gravelly sandy clay loam.	GC, SM-SC, GM-GC, SC	A-2	5-25	40-75	25-35	20-30	10-20	25-40	5-15
	23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
55 Larand	0-15	Very gravelly fine sandy loam, very gravelly sandy loam.	GM-GC, GC	A-2	5-15	55-65	45-55	30-50	20-35	25-30	5-10
	15-22	Very cobbly sandy clay loam.	SC	A-2	30-35	65-75	50-60	30-50	20-35	35-40	15-20
	22-28	Extremely cobbly sandy clay loam.	SC	A-2	55-65	65-75	50-60	30-50	20-35	30-35	10-15
	28-60	Extremely cobbly loamy sand.	SM	A-1	50-70	65-80	55-70	25-40	15-25	---	NP
56 Larkson	0-3	Stony loam	ML, SM, CL-ML	A-4	1-15	80-90	75-85	65-80	45-65	20-30	NP-10
	3-8	Gravelly loam, loam, gravelly fine sandy loam.	ML, GM, SM, SM-SC	A-4	0-15	70-90	65-85	55-80	30-65	20-30	NP-10
	8-40	Clay loam, clay, silty clay loam.	CH, CL	A-7	0-5	90-100	80-100	75-95	60-80	40-55	25-35
	40-60	Silt loam, clay loam, loam.	CL	A-6	0-5	90-100	80-100	60-80	55-75	30-35	10-15

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
57--------------- Libeg	0-7	Extremely cobbly sandy loam.	GW-GM, GM, GM-GC, GP-GM	A-1, A-2	45-75	30-55	25-45	15-30	5-20	20-30	NP-10
	7-36	Extremely cobbly sandy loam, extremely cobbly sandy clay loam.	GW-GC, GM-GC, GM	A-1, A-2	45-75	25-55	20-45	15-25	5-25	20-30	NP-10
	36-60	Extremely cobbly sandy loam.	GW, GW-GM, GM, GM-GC	A-1, A-2	45-75	15-45	10-35	5-25	0-20	20-30	NP-10
58--------------- Limon	0-3	Silty clay loam	CL	A-6	0	100	95-100	90-100	60-90	30-40	15-25
	3-60	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0	100	95-100	95-100	75-95	35-60	20-40
59, 60----------- Limon	0-3	Silty clay loam	CL	A-6, A-7	0	100	90-100	85-100	80-100	35-45	10-20
	3-60	Clay, silty clay	CH, CL	A-7	0	100	95-100	85-100	70-100	45-60	20-35
61: Limon-----------	0-3	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-95	40-55	15-30
	3-46	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	95-100	80-95	40-65	20-45
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gaynor----------	0-4	Silty clay loam	CL	A-6	0	95-100	95-100	95-100	90-95	30-40	15-25
	4-22	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	95-100	95-100	75-95	40-60	20-40
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
62: Limon-----------	0-3	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-95	40-55	15-30
	3-46	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	95-100	80-95	40-65	20-45
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gaynor----------	0-4	Silty clay loam	CL	A-6	0	95-100	95-100	95-100	90-95	30-40	15-25
	4-30	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	95-100	95-100	75-95	40-60	20-40
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
63: Limon-----------	0-3	Silty clay loam	CL	A-6, A-7	0	100	90-100	85-100	80-100	35-45	10-20
	3-60	Clay, silty clay	CH, CL	A-7	0	100	95-100	85-100	70-100	45-60	20-35
Gaynor----------	0-4	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	80-100	35-45	15-25
	4-30	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	95-100	85-100	70-100	40-60	20-40
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
64: Louviers--------	0-3	Very channery clay loam.	GC	A-6, A-2	0-5	35-50	35-50	30-45	25-40	30-40	10-20
	3-16	Clay, silty clay, silty clay loam.	CL, CH	A-7, A-6	0-15	90-100	80-100	80-100	75-95	35-60	15-45
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
64:											
Travessilla-----	0-4	Channery loam----	SM-SC, GM-GC, SM, GM	A-1, A-2, A-4	0-10	55-80	55-75	35-60	20-45	15-25	NP-10
	4-14	Loam, channery loam.	CL-ML, GM-GC, SM-SC	A-4	0-20	60-90	55-85	50-75	35-55	20-25	5-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
65, 66----------- Manvel	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	95-100	70-90	25-35	5-15
	6-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	85-100	85-100	85-100	80-90	20-40	5-20
67--------------- Manvel	0-30	Silty clay loam	CL	A-6	0	95-100	95-100	85-100	65-90	25-40	10-20
	30-60	Silty clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	80-95	20-35	5-20
68--------------- Manzanola	0-4	Loam-------------	CL-ML	A-4	0-5	95-100	80-95	70-95	50-75	25-30	5-10
	4-17	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-90	35-50	20-30
	17-60	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-95	60-90	30-40	15-25
69--------------- Martinsdale	0-5	Sandy loam-------	SM-SC, SM	A-2, A-4	0-5	95-100	90-100	50-80	25-45	20-30	NP-10
	5-15	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0-5	85-100	80-100	60-80	40-70	30-40	10-15
	15-45	Sandy clay loam, clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	85-100	80-100	60-80	40-70	25-40	5-15
	45-60	Gravelly sandy loam, gravelly sandy clay loam, very gravelly loam.	SM, GM	A-4, A-2, A-1	0-10	45-80	35-70	25-60	15-50	25-35	NP-10
70--------------- Martinsdale Variant	0-16	Sandy loam-------	SM-SC, SM	A-2	0	95-100	90-100	55-70	25-35	25-30	5-10
	16-33	Sandy loam, sandy clay loam.	SC, SM-SC	A-2, A-4, A-6	0	95-100	90-100	65-85	30-50	25-35	5-15
	33-60	Sandy loam-------	SM-SC	A-2	0	95-100	90-100	55-70	25-35	25-30	5-10
71--------------- Midway	0-3	Clay loam--------	CL	A-6	0	75-100	75-100	70-100	70-95	30-40	10-20
	3-16	Extremely shaly clay, clay, silty clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	70-95	35-60	15-40
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
72:											
Midway----------	0-3	Very gravelly clay loam.	GC	A-2, A-7	15-35	40-65	35-55	30-55	25-45	35-45	15-20
	3-15	Extremely shaly clay.	CH, CL	A-7	0-15	85-100	80-100	70-100	55-95	40-60	20-35
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
72:											
Cascajo---------	0-6	Very gravelly sandy loam.	GM	A-1	0-15	35-60	30-50	15-35	10-20	20-30	NP-5
	6-21	Extremely cobbly sandy loam, very cobbly sandy loam.	GM, SM	A-1	45-55	35-65	30-55	15-40	10-25	---	NP
	21-60	Extremely cobbly sand, very cobbly sand, extremely cobbly loamy sand.	GP, SP, GP-GM, SP-SM	A-1	45-55	35-65	30-55	15-40	0-15	---	NP
73--------------- Morset	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	85-95	85-95	80-85	55-70	20-35	5-15
	8-21	Clay loam--------	CL	A-6	0	90-100	90-100	80-90	60-70	30-40	10-20
	21-60	Loam, sandy clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	75-100	75-100	70-80	35-65	25-35	5-15
74:											
Mussel----------	0-6	Sandy loam-------	SM, SM-SC	A-4, A-2	0-5	85-100	80-100	50-70	25-40	20-30	NP-10
	6-60	Sandy loam, loam	SM-SC, CL-ML	A-4, A-2	0-5	85-100	80-100	55-85	30-55	25-30	5-10
Bronell---------	0-16	Gravelly sandy loam.	GM, GM-GC, SM-SC	A-1, A-2	0-15	55-95	50-85	30-60	15-35	20-30	NP-10
	16-60	Extremely gravelly sandy loam, very gravelly sandy loam.	GP, GP-GM, GM, GM-GC	A-1, A-2	0-30	20-60	10-50	5-35	0-20	20-30	NP-10
75--------------- Neville	0-3	Fine sandy loam	SM, ML	A-4, A-2	0-5	90-100	75-100	60-95	30-55	---	NP
	3-60	Loam, clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
76--------------- Nunn	0-4	Stony loam-------	CL-ML, CL	A-4	10-15	90-100	85-100	70-90	50-75	25-30	5-10
	4-27	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	65-85	30-45	15-25
	27-60	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	90-100	75-95	55-80	25-35	5-15
77--------------- Nunn	0-4	Loam-------------	CL-ML, CL	A-4	0	100	90-100	75-95	55-80	25-30	5-10
	4-32	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	65-85	30-45	15-25
	32-60	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	90-100	75-95	55-80	25-35	5-15
78--------------- Nunn	0-10	Clay loam--------	CL	A-6	0	100	90-100	75-95	65-80	25-35	10-20
	10-35	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	65-85	30-45	15-25
	35-60	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	90-100	75-95	55-80	25-35	5-15
79--------------- Nunn	0-4	Clay loam--------	CL	A-6	0	100	90-100	75-95	65-80	25-35	10-20
	4-32	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	65-85	30-45	15-25
	32-60	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	90-100	75-95	55-80	25-35	5-15

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
80---------------- Otero	0-3	Loamy fine sand	SM	A-2, A-4	0-1	90-100	85-100	50-80	20-40	---	NP
	3-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0-1	90-100	75-100	40-80	25-50	20-30	NP-5
81---------------- Otero	0-2	Fine sandy loam	SM	A-2, A-4	0-1	90-100	75-100	40-80	25-50	20-30	NP-5
	2-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0-1	90-100	75-100	40-80	25-50	20-30	NP-5
82---------------- Pendant	0-4	Extremely gravelly loam	GM, GM-GC	A-1, A-2	25-40	35-60	30-45	20-45	15-35	20-30	NP-10
	4-11	Very gravelly loam, extremely gravelly loam, very cobbly loam.	GM, GM-GC	A-1, A-2	20-40	35-60	30-50	20-45	15-35	20-30	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
83: Penrose----------	0-15	Channery loam----	ML, GM, CL-ML, GM-GC	A-4	5-15	60-75	60-75	50-75	40-60	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Minnequa---------	0-2	Silt loam--------	ML, CL-ML	A-4	0-1	95-100	95-100	80-100	65-90	20-30	NP-10
	2-28	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	95-100	80-90	25-40	5-20
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
84: Penrose----------	0-15	Channery loam----	ML, GM, CL-ML, GM-GC	A-4	5-15	60-75	60-75	50-75	40-60	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
85---------------- Querida	0-11	Gravelly sandy loam.	SM	A-2, A-1	0	60-75	55-70	40-60	20-35	20-25	NP-5
	11-60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A-4, A-2, A-1	0	70-90	60-80	40-70	20-40	20-25	NP-5
86: Raleigh----------	0-2	Very gravelly sandy loam.	GM-GC, GM	A-1, A-2	0-5	35-55	30-50	20-35	10-20	15-25	NP-10
	2-18	Extremely gravelly sandy loam, very gravelly sandy loam.	GM	A-1	0-5	30-45	20-35	15-30	10-15	15-20	NP-5
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
87:											
Redcameron------	0-2	Channery loam----	GM, GM-GC, CL-ML, ML	A-4, A-2	0-5	60-95	55-80	45-75	30-60	20-30	NP-10
	2-12	Channery very fine sandy loam, channery fine sandy loam, channery loam.	GM, GM-GC, SM-SC, CL-ML	A-2, A-4	0-5	60-95	55-80	45-75	30-55	20-30	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Teaspoon--------	0-3	Very stony sandy loam.	GM	A-1	10-40	35-60	25-50	15-40	10-25	20-30	NP-5
	3-8	Very gravelly sandy clay loam, extremely channery sandy loam.	GM-GC, GC	A-2	0-30	25-50	15-40	10-35	5-20	25-35	5-15
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
88--------------- Rentsac	0-3	Very channery loam.	SM, GM	A-2, A-1	15-25	45-70	35-60	25-45	15-35	20-25	NP-5
	3-10	Very channery loam, extremely gravelly sandy loam, very flaggy loam.	SM, GM	A-2, A-4, A-1	15-50	40-75	30-65	15-45	10-40	20-25	NP-5
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
89--------------- Rentsac Variant	0-7	Channery loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-15	60-80	55-75	45-70	35-50	25-35	5-15
	7-19	Very channery loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6	5-30	30-55	30-50	25-50	20-40	25-35	5-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
90--------------- Resort	0-12	Very gravelly sandy loam.	GM	A-1	0-10	25-50	25-50	15-35	10-25	20-25	NP-5
	12-17	Very gravelly loamy sand, very gravelly sand, extremely gravelly loamy sand.	GP, GP-GM, GM	A-1	0-10	25-50	25-50	5-30	0-15	---	NP
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
91:											
Resort	0-12	Very gravelly sandy loam.	GM	A-1	0-10	25-50	25-50	15-35	10-25	20-25	NP-5
	12-17	Very gravelly loamy sand, very gravelly sand, extremely gravelly loamy sand.	GP, GP-GM, GM	A-1	0-10	25-50	25-50	5-30	0-15	---	NP
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
92: Riverwash	0-6	Very gravelly sand.	GP, GW	A-1	0-15	25-55	25-50	10-30	0-5	---	NP
	6-60	Stratified gravelly sand to extremely gravelly coarse sand.	GP, SP, GW, SW	A-1	0-25	25-55	25-50	10-30	0-5	---	NP
93:											
Rizozo	0-3	Channery loam	GM-GC, GC, CL-ML, CL, SM-SC, SC	A-4	0-10	60-90	55-80	45-75	35-60	25-30	5-10
	3-13	Loam, channery loam, silt loam.	CL, SC, GC	A-4, A-6	0-10	65-95	60-90	50-85	35-75	25-35	10-15
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Neville	0-3	Fine sandy loam	SM, ML	A-4, A-2	0-5	90-100	75-100	60-95	30-55	---	NP
	3-60	Loam, clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
94:											
Rizozo	0-3	Channery loam	GM-GC, GC, CL-ML, CL, SM-SC, SC	A-4	0-10	60-90	55-80	45-75	35-60	25-30	5-10
	3-13	Loam, channery loam, silt loam.	CL, SC, GC	A-4, A-6	0-10	65-95	60-90	50-85	35-75	25-35	10-15
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
95: Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
96, 97: Rogert	0-5	Very gravelly sandy loam.	SP-SM, SM-SC, GP-GM, GM	A-1, A-2	0-5	50-75	30-50	15-30	5-15	20-30	NP-10
	5-17	Extremely gravelly sandy loam, very gravelly sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0-5	40-55	20-35	10-25	5-15	20-30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
98---------------Roygorge	0-2	Very gravelly sandy clay loam.	GM-GC, GP-GC, SM-SC, SC	A-2	5-20	35-70	30-60	20-35	5-30	20-35	5-15
	2-12	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	GM-GC, GP-GC	A-2	5-20	25-55	20-45	15-25	5-20	25-35	5-15
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
99---------------Sawfork	0-8	Very cobbly loam	GM-GC, SM-SC	A-2, A-4	30-60	65-80	60-70	50-65	30-50	20-30	5-10
	8-14	Very gravelly clay loam, very gravelly sandy clay loam, very cobbly clay loam.	GM-GC, GC	A-1, A-2, A-4, A-6	15-55	40-80	35-70	25-55	10-40	25-40	5-15
	14-48	Loam, sandy clay loam, sandy loam.	SM-SC, CL-ML	A-4	0-5	90-100	80-100	50-80	35-65	20-30	5-10
	48	Weathered bedrock	---	---	---	---	---	---	---	---	---
100--------------Sedillo	0-5	Cobbly sandy loam	SM-SC, SM	A-2	15-30	75-95	70-90	45-65	20-35	20-30	NP-10
	5-9	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	15-25	45-65	45-60	35-55	15-35	30-40	10-20
	9-60	Very cobbly sandy loam, very gravelly sandy loam.	SM-SC, SM, GM-GC, GM	A-2	15-50	50-65	45-60	30-50	15-30	20-30	NP-10
101--------------Sedillo	0-3	Very gravelly loam.	GM-GC	A-2	15-25	45-65	45-60	30-50	15-35	25-30	5-10
	3-20	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	15-25	45-65	45-60	35-55	15-35	30-40	10-20
	20-60	Very cobbly sandy loam, very gravelly sandy loam.	SM-SC, SM, GM-GC, GM	A-2	15-50	50-65	45-60	30-50	15-30	20-30	NP-10
102--------------Seitz	0-15	Gravelly fine sandy loam.	SM, GM	A-1, A-2, A-4	0-10	60-80	50-75	40-65	20-40	20-25	NP-5
	15-34	Very cobbly clay, very gravelly clay loam, very cobbly clay loam.	GC, CL, CH	A-2, A-7	15-45	40-65	35-60	35-60	30-55	40-60	20-35
	34-60	Very cobbly sandy clay loam, very cobbly clay loam, very gravelly sandy clay loam.	GC	A-2, A-6	15-55	40-65	35-60	35-60	25-50	30-40	10-20

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
103:											
Seitz-----------	0-8	Very stony loam	GM, GC, GM-GC	A-1, A-2, A-4, A-6	15-45	40-55	35-50	30-50	20-40	20-35	NP-15
	8-60	Very cobbly clay, very gravelly clay loam, very cobbly clay loam.	GC, CL, CH	A-2, A-7	15-45	40-65	35-60	35-60	30-55	40-60	20-35
Bushvalley------	0-4	Cobbly loam------	CL-ML, SM-SC	A-4	20-25	80-90	75-85	65-80	45-60	20-30	5-10
	4-11	Very cobbly sandy clay loam, very cobbly clay loam, extremely cobbly clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-4, A-6	35-55	60-80	55-75	50-70	25-50	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
104-------------- Shanta	0-49	Loam-------------	CL-ML, CL	A-4, A-6	0	85-100	80-100	75-90	60-75	25-35	5-20
	49-60	Stratified sandy loam to loamy sand, loam.	CL-ML, SM-SC, SM	A-2, A-4	0-5	80-100	75-100	50-85	20-65	20-30	NP-10
105-------------- Shanta	0-27	Loam-------------	CL-ML	A-4	0	85-100	80-100	75-90	60-75	25-30	5-10
	27-60	Stratified sandy clay loam, loam, silty clay loam.	SC, CL	A-2, A-6	0-5	80-100	75-100	50-95	30-65	25-40	10-20
106:											
Shanta----------	0-12	Loam-------------	CL-ML	A-4	0	85-100	80-100	75-90	60-75	25-30	5-10
	12-60	Fine sandy loam, loam, sandy clay loam.	SC, CL, CL-ML, SM-SC	A-2, A-6	0-5	80-100	75-100	50-95	30-65	25-40	5-20
Nederland-------	0-8	Extremely cobbly sandy loam.	SM, GM, GM-GC, SM-SC	A-1	30-50	50-75	40-60	25-40	10-25	20-25	NP-5
	8-31	Extremely cobbly sandy clay loam, very cobbly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-1	40-60	40-65	30-50	25-45	10-30	25-35	5-15
	31-60	Extremely cobbly sandy loam, extremely cobbly coarse sandy loam, very cobbly sandy loam.	GM, GP-GM, SM, SP-SM	A-1	40-60	40-65	30-50	15-35	5-20	20-25	NP-5
107-------------- Shingle	0-4	Very cobbly sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	30-50	45-70	40-60	25-40	10-25	20-30	NP-10
	4-17	Loam, clay loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	90-100	90-100	70-100	40-80	25-35	5-15
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
108-------------- Shingle	0-6	Loam-------------	ML, CL-ML	A-4	0-5	75-100	75-100	70-95	55-75	25-35	NP-10
	6-13	Clay loam, loam, silty clay loam.	CL	A-6	0	75-100	75-100	65-100	50-85	30-40	15-20
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
109-------------- Shrine	0-10	Loam-------------	CL-ML	A-4	0-5	90-100	75-100	70-95	55-80	20-30	5-10
	10-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0-5	90-100	75-100	70-95	55-80	25-40	5-20
110:											
Swissvale-------	0-2	Very gravelly sandy loam.	GM, GW-GM	A-1	0-15	40-55	35-45	15-30	10-25	20-25	NP-5
	2-5	Very gravelly sandy clay loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-20	40-60	35-50	20-35	10-30	25-30	5-10
	5-9	Very gravelly clay loam, very gravelly sandy clay loam, very gravelly sandy loam.	GC, GM-GC	A-1, A-2	0-20	35-60	30-50	20-45	10-35	25-35	5-15
	9-19	Weathered bedrock	---	---	---	---	---	---	---	---	---
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rentsac---------	0-3	Very channery loam.	SM, GM	A-2, A-1	15-25	45-70	35-60	25-45	15-35	20-25	NP-5
	3-8	Extremely channery loam, extremely gravelly sandy loam, very flaggy loam.	SM, GM	A-2, A-4, A-1	15-50	40-75	30-65	15-45	10-40	20-25	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
111-------------- Teaspoon	0-4	Very gravelly sandy loam.	GM	A-1	0-10	40-60	30-50	20-40	10-25	20-30	NP-5
	4-11	Very gravelly sandy clay loam, extremely gravelly sandy clay loam.	GM-GC, GC	A-2	0-30	25-50	15-40	10-35	5-20	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
112-------------- Tecolote	0-3	Very gravelly sandy loam.	GM-GC	A-2	5-20	40-60	35-50	20-40	10-25	20-25	5-10
	3-9	Very gravelly coarse sandy loam, very gravelly sandy loam.	GM-GC	A-2	5-20	40-60	35-50	10-40	10-25	20-25	5-10
	9-41	Extremely gravelly sandy clay loam, very gravelly loam, very gravelly clay loam.	GC	A-2	15-30	30-55	25-50	15-35	10-20	25-40	10-20
	41-60	Extremely gravelly coarse sandy loam, extremely gravelly sandy loam.	GM-GC, GP-GC	A-2	30-40	20-40	15-35	10-25	5-15	20-30	5-10

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
113-------------- Tecolote	0-15	Very cobbly sandy loam.	GM	A-1, A-2	30-35	50-70	40-60	25-45	20-35	20-25	NP-5
	15-41	Extremely gravelly sandy clay loam, very gravelly loam, very gravelly clay loam.	GC	A-2	15-30	30-55	25-50	15-35	10-20	25-40	10-20
	41-60	Extremely gravelly coarse sandy loam, extremely gravelly sandy loam.	GM-GC, GP-GC	A-2	30-40	20-40	15-35	10-25	5-15	20-30	5-10
114-------------- Tellura	0-13	Gravelly clay loam.	GM-GC, GC, CL-ML, CL	A-4, A-6	0-10	55-90	50-80	45-75	35-65	25-40	5-15
	13-48	Very gravelly clay, very gravelly sandy clay.	GC	A-2, A-6	0-15	35-60	30-50	25-50	15-40	35-55	15-30
	48-60	Extremely gravelly sandy clay loam, very gravelly sandy clay loam.	GC, GM-GC, GP-GC	A-2	5-30	25-55	20-45	15-40	5-25	25-35	5-15
115-------------- Tolex	0-2	Very gravelly sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	0-25	45-60	35-50	20-35	10-20	20-30	NP-10
	2-7	Very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam.	GP-GM, GM, GM-GC, SM	A-1, A-2	0-25	25-60	15-50	10-35	5-20	20-30	NP-10
	7-17	Extremely gravelly sandy clay loam, extremely channery sandy clay loam.	GM-GC, GC, GP-GC	A-2	0-25	15-40	10-30	10-25	5-15	25-35	5-15
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
116: Tolex-----------	0-5	Very channery sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	0-25	45-60	35-50	20-35	10-20	20-30	NP-10
	5-12	Very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam.	GP-GM, GM, GM-GC, SM	A-1, A-2	10-25	25-60	15-50	10-35	5-20	20-30	NP-10
	12-19	Extremely gravelly sandy clay loam, extremely channery sandy clay loam.	GM-GC, GC, GP-GC	A-2	10-25	15-40	10-30	10-25	5-15	25-35	5-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
116:											
Larkson---------	0-4	Stony loam-------	ML, SM, CL-ML	A-4	1-15	80-90	75-85	65-80	45-65	20-30	NP-10
	4-8	Gravelly loam, loam, gravelly fine sandy loam.	ML, GM, SM, SM-SC	A-4	0-5	70-90	65-85	55-80	30-65	20-30	NP-10
	8-40	Clay loam, clay, silty clay loam.	CH, CL	A-7	0-5	90-100	80-100	75-95	60-80	40-55	25-35
	40-60	Silt loam, clay loam, loam.	CL	A-6	0-5	90-100	80-100	60-80	55-75	30-35	10-15
117------------- Travessilla	0-4	Channery loam----	SM-SC, GM-GC, SM, GM	A-1, A-2, A-4	0-5	55-80	55-75	35-60	20-45	15-25	NP-10
	4-14	Loam, channery loam, stony loam.	CL-ML, GM-GC, SM-SC	A-4	0-20	60-90	55-85	50-75	35-55	20-25	5-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
118:											
Travessilla-----	0-4	Channery sandy loam.	SM-SC	A-2	0-5	75-85	55-70	35-50	15-25	20-25	5-10
	4-9	Loam, sandy loam, fine sandy loam.	ML, SM, CL-ML, SM-SC	A-6, A-4, A-2	0-5	100	100	70-85	35-55	25-35	NP-10
	9	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
119:											
Troutdale-------	0-7	Loam------------	CL-ML, CL	A-4, A-6	0-5	85-100	75-100	65-95	50-75	20-35	5-15
	7-22	Sandy clay loam, gravelly sandy clay loam, loam.	GC, CL, CL-ML, GM-GC	A-2, A-4, A-6	0-5	70-100	65-95	35-80	25-60	25-35	5-15
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rogert----------	0-5	Very gravelly sandy loam.	SP-SM, SM-SC, GP-GM, GM	A-1, A-2	0-5	50-75	30-50	15-30	5-15	20-30	NP-10
	5-17	Extremely gravelly sandy loam, very gravelly sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0-5	40-55	20-35	10-25	5-15	20-30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
120:											
Ustic Torriorthents--	0-4	Very bouldery sandy loam.	GM, GP-GM, SM, SP-SM	A-1	20-50	50-70	25-45	15-30	10-20	20-30	NP-5
	4-7	Extremely gravelly sandy loam, extremely gravelly coarse sandy loam.	GM, GP-GM, SM, SP-SM	A-1	0-20	45-65	20-40	10-30	5-15	20-30	NP-5
	7-18	Weathered bedrock	---	---	---	---	---	---	---	---	---
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
120:											
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
121:											
Ustic Torriorthents	0-2	Very gravelly loam.	GM-GC	A-2, A-4	5-20	40-65	35-55	30-50	25-45	20-30	5-10
	2-27	Variable	CL, GC, SC	A-6	0-5	60-95	55-90	50-80	40-80	30-40	10-20
	27-42	Variable	CL-ML, CL, GC, GM-GC	A-4, A-6, A-2	0-5	60-95	55-90	45-80	30-80	25-35	5-15
	42	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sedillo	0-4	Extremely cobbly loam.	GM-GC	A-2	40-55	25-45	20-40	15-35	10-30	25-30	5-10
	4-10	Extremely cobbly sandy clay loam.	GC	A-2	40-55	25-45	20-40	15-35	10-20	30-35	10-15
	10-35	Extremely stony sandy clay loam, extremely stony loam.	GM-GC, GC	A-2	45-70	35-60	30-45	30-45	15-30	25-35	5-15
	35-60	Loam	CL	A-6	0-10	90-100	90-100	65-90	50-75	25-35	10-15
122 Wages	0-5	Loam	CL-ML, SC, SM-SC, CL	A-4	0	90-100	75-100	65-90	45-75	20-30	5-10
	5-21	Clay loam, sandy clay loam, loam.	CL, SC	A-6	0	95-100	90-100	75-95	35-75	25-40	15-25
	21-60	Loam, fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	95-100	75-100	60-95	35-70	20-40	5-25
123:											
Wahatoya	0-2	Very gravelly sandy loam.	GM, SM	A-1	0-15	35-60	30-50	20-30	10-15	20-30	NP-5
	2-10	Very gravelly sandy loam.	GM, SM	A-1	0-15	35-60	30-50	20-30	10-15	20-30	NP-5
	10-38	Extremely gravelly sandy loam, extremely gravelly sandy clay loam.	GM-GC, GC, GP-GC	A-2	0-30	20-40	15-35	10-20	5-15	25-35	5-15
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tolex	0-5	Very channery sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2	0-25	45-60	35-50	20-35	10-20	20-30	NP-10
	5-12	Very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam.	GP-GM, GM, GM-GC, SM	A-1, A-2	10-25	25-60	15-50	10-35	5-20	20-30	NP-10
	12-19	Extremely gravelly sandy clay loam, extremely channery sandy clay loam.	GM-GC, GC, GP-GC	A-2	10-25	15-40	10-30	10-25	5-15	25-35	5-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
124:											
Wann	0-12	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	90-100	60-80	30-45	20-25	NP-5
	12-48	Stratified sandy loam to silt loam.	ML, SM, SM-SC, CL-ML	A-4, A-2	0	95-100	90-100	50-80	30-70	20-25	NP-5
	48-60	Extremely gravelly sandy loam, extremely gravelly loamy sand.	GP, GP-GM, GM	A-1	15-35	25-40	15-30	10-25	0-20	20-25	NP
Shanta	0-27	Loam	CL-ML	A-4	0	85-100	80-100	75-90	60-75	25-30	5-10
	27-60	Sandy clay loam, loam, clay loam.	SC, CL	A-2, A-6	0-5	80-100	75-100	50-95	30-65	25-40	10-20
125 Wesix	0-3	Very channery loam.	GM	A-2, A-4	10-20	45-70	40-60	35-55	25-40	20-30	NP-5
	3-13	Very channery loam, very gravelly loam.	GM	A-2, A-4	10-20	45-70	40-55	35-50	25-40	20-30	NP-5
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
126:											
Wetmore	0-3	Very gravelly sandy loam.	GP-GM, GM	A-2, A-1	0-20	30-55	25-50	10-35	5-20	20-25	NP-5
	3-10	Very gravelly sandy loam, extremely gravelly sandy loam.	GP-GM, GM-GC	A-2, A-1	5-40	30-60	25-50	15-25	10-15	25-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bundo	0-8	Very gravelly sandy loam.	GM, SM	A-1	10-30	40-65	35-60	20-45	10-30	20-25	NP-5
	8-26	Extremely gravelly sandy loam, extremely cobbly sandy loam, extremely gravelly loam.	GM, GW-GM, GP-GM	A-1, A-2	15-45	25-55	20-50	10-40	5-30	20-25	NP-5
	26-45	Extremely gravelly sandy clay loam, extremely cobbly sandy clay loam, extremely gravelly loam.	GW-GC, GM-GC, GC, GP-GM	A-1, A-2	15-45	25-55	20-50	15-45	10-35	25-35	5-10
	45-60	Extremely gravelly sandy loam, extremely gravelly loam, extremely cobbly sandy loam.	GM, GM-GC, GC, GW-GC	A-1, A-2	20-45	25-55	20-45	10-40	5-35	20-30	NP-10
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
127:											
Wetmore----------	0-3	Very gravelly sandy loam.	GP-GM, GM	A-2, A-1	0-20	30-55	25-50	10-35	5-20	20-25	NP-5
	3-10	Very gravelly sandy loam, extremely gravelly sandy loam.	GP-GM, GM-GC	A-2, A-1	5-40	30-60	25-50	15-25	10-15	25-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
128-------------- Wiley	0-4	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	4-21	Silty clay loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	70-95	25-35	10-20
	21-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	80-95	25-35	5-15
129-------------- Wiley	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	5-27	Silty clay loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	70-95	25-35	10-20
	27-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	80-95	25-35	5-15
130-------------- Youga	0-12	Sandy loam-------	SM, SM-SC	A-2, A-4	0-10	90-100	85-100	50-70	25-40	20-30	NP-10
	12-42	Gravelly sandy clay loam, gravelly clay loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-1, A-2, A-4, A-6	0-10	60-100	55-90	45-80	20-60	25-40	5-15
	42-60	Very gravelly sandy loam, gravelly sandy loam.	GM, GM-GC, SM, SM-SC	A-1	0-10	45-75	40-65	25-45	10-25	20-30	NP-10

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
1---------------- Adderton	0-3	18-27	1.30-1.40	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low--------	0.24	5	5	2-6
	3-49	18-30	1.40-1.50	0.6-2.0	0.14-0.18	6.6-7.8	<2	Low--------	0.28			
	49-60	5-15	1.60-1.70	6.0-20.0	0.04-0.08	6.6-7.8	<2	Low--------	0.02			
2---------------- Amalia	0-4	18-27	1.20-1.30	0.6-2.0	0.08-0.10	6.6-7.8	<2	Low--------	0.10	5	8	.5-2
	4-13	20-35	1.20-1.30	0.6-2.0	0.08-0.11	6.6-7.8	<2	Moderate	0.15			
	13-75	10-20	1.45-1.55	0.6-2.0	0.05-0.07	7.9-8.4	<2	Low--------	0.10			
3---------------- Aquic Ustifluvents	0-13	15-25	1.25-1.35	0.6-2.0	0.13-0.16	7.9-8.4	2-8	Low--------	0.28	5	5	.5-2
	13-40	8-25	1.40-1.50	0.6-2.0	0.09-0.14	7.9-8.4	2-8	Low--------	0.28			
	40-60	1-5	1.60-1.70	>20.0	0.01-0.03	7.9-8.4	2-4	Low--------	0.02			
4---------------- Aquolls	0-23	10-19	1.35-1.45	2.0-6.0	0.11-0.15	7.4-8.4	<4	Low--------	0.10	5	5	3-6
	23-60	10-19	1.40-1.50	2.0-6.0	0.10-0.15	7.4-8.4	<4	Low--------	0.15			
5---------------- Arents	0-11	17-27	1.20-1.35	0.2-2.0	0.10-0.16	4.5-8.4	<4	Low--------	0.32	5	5	<1
	11-60	15-35	1.15-1.40	0.2-6.0	0.02-0.16	4.5-8.4	<4	Low--------	0.32			
6---------------- Bloom	0-3	20-27	1.25-1.35	0.6-2.0	0.14-0.18	7.9-8.4	2-8	Low--------	0.32	5	8	<1
	3-49	20-35	1.20-1.30	0.6-2.0	0.18-0.20	7.9-8.4	<4	Moderate	0.37			
	49-60	3-8	1.55-1.65	>20.0	0.01-0.03	7.9-8.4	<4	Low--------	0.02			
7---------------- Boyle	0-3	10-20	1.30-1.40	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low--------	0.15	1	8	2-4
	3-17	20-30	1.40-1.50	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low--------	0.10			
	17	---	---	---	---	---	---	-----------	----			
8:												
Boyle------------	0-6	10-20	1.30-1.40	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low--------	0.15	1	8	2-4
	6-17	20-30	1.40-1.50	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low--------	0.10			
	17	---	---	---	---	---	---	-----------	----			
Martinsdale------	0-5	15-20	1.30-1.50	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low--------	0.24	5	3	2-4
	5-15	25-35	1.30-1.50	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.37			
	15-45	20-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	<2	Moderate	0.37			
	45-60	15-30	1.50-1.70	0.2-0.6	0.08-0.10	7.4-8.4	<2	Low--------	0.15			
9:												
Boyle------------	0-3	10-20	1.30-1.40	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low--------	0.15	1	8	2-4
	3-17	20-30	1.40-1.50	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low--------	0.10			
	17	---	---	---	---	---	---	-----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
10--------------- Bronell	0-16	10-18	1.25-1.35	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low--------	0.10	5	7	.5-2
	16-60	7-16	1.50-1.65	2.0-6.0	0.02-0.06	7.9-8.4	<2	Low--------	0.05			
11:												
Bronell----------	0-6	15-25	1.15-1.25	0.6-2.0	0.06-0.10	7.4-8.4	<2	Low--------	0.05	5	8	.5-2
	6-40	16-25	1.40-1.55	0.6-2.0	0.05-0.09	7.9-8.4	<2	Low--------	0.05			
	40-60	7-16	1.50-1.65	2.0-6.0	0.02-0.06	7.9-8.4	<2	Low--------	0.05			
Kerhayden--------	0-8	10-17	1.30-1.40	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low--------	0.10	5	7	.5-2
	8-44	20-35	1.40-1.50	0.6-2.0	0.11-0.17	7.9-8.4	<2	Moderate	0.15			
	44-60	8-16	1.50-1.60	0.6-2.0	0.03-0.08	7.9-8.4	<2	Low--------	0.05			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
12:												
Bronell Variant-	0-3	15-27	1.10-1.20	0.6-2.0	0.05-0.09	7.9-8.4	<2	Low--------	0.05	2	8	.5-2
	3-60	15-27	1.40-1.55	0.6-2.0	0.06-0.09	7.9-8.4	<2	Low--------	0.05			
Wesix-----------	0-3	15-25	1.15-1.25	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low--------	0.17	1	8	.5-2
	3-13	15-25	1.25-1.35	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low--------	0.17			
	13	---	---	---	---	---	---	-----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
13--------------- Bundo	0-27	12-20	1.25-1.40	2.0-6.0	0.06-0.09	5.6-6.5	<2	Low--------	0.10	5	8	1-2
	27-60	18-25	1.30-1.45	0.6-2.0	0.05-0.08	5.6-6.5	<2	Low--------	0.10			
14--------------- Bushvalley	0-4	15-25	1.20-1.30	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low--------	0.15	1	8	2-3
	4-11	20-35	1.40-1.50	0.2-0.6	0.06-0.09	6.1-7.8	<2	Low--------	0.05			
	11	---	---	---	---	---	---	-----------	----			
15:												
Bushvalley------	0-3	15-25	1.20-1.30	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low--------	0.15	1	8	2-3
	3-12	20-35	1.40-1.50	0.2-0.6	0.06-0.09	6.1-7.8	<2	Low--------	0.05			
	12	---	---	---	---	---	---	-----------	----			
Whiteman--------	0-2	18-23	1.25-1.40	0.6-2.0	0.10-0.14	6.6-7.8	<2	Low--------	0.15	1	8	1-4
	2-11	20-35	1.40-1.55	0.6-2.0	0.07-0.11	6.6-7.8	<2	Low--------	0.17			
	11	---	---	---	---	---	---	-----------	----			
16--------------- Cascajo	0-6	8-17	1.25-1.35	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low--------	0.10	5	8	.5-1
	6-21	8-15	1.30-1.40	2.0-6.0	0.03-0.06	7.9-8.4	<2	Low--------	0.05			
	21-60	2-10	1.55-1.65	6.0-20	0.02-0.05	7.9-8.4	<2	Low--------	0.02			
17--------------- Cascajo Variant	0-6	10-16	1.25-1.35	2.0-6.0	0.07-0.10	6.6-7.8	<2	Low--------	0.05	5	6	1-3
	6-60	2-10	1.50-1.60	>20	0.02-0.07	6.6-7.8	<2	Low--------	0.02			
18:												
Casvare---------	0-3	15-25	1.15-1.25	0.6-6.0	0.06-0.10	6.6-7.8	<2	Low--------	0.10	1	8	1-3
	3-17	15-25	1.20-1.30	0.6-6.0	0.04-0.10	7.9-8.4	<2	Low--------	0.05			
	17-24	---	---	---	---	---	---	-----------	----			
	24	---	---	---	---	---	---	-----------	----			
Teaspoon--------	0-3	13-18	1.25-1.35	2.0-6.0	0.05-0.08	6.1-7.8	<2	Low--------	0.05	1	8	2-4
	3-11	20-30	1.30-1.40	0.6-2.0	0.06-0.11	6.1-7.8	<2	Low--------	0.02			
	11	---	---	---	---	---	---	-----------	----			
19:												
Cathedral-------	0-6	5-18	1.20-1.25	6.0-20	0.05-0.07	6.1-7.3	<2	Low--------	0.10	1	8	2-4
	6-19	5-18	1.40-1.50	6.0-20	0.05-0.07	6.1-7.3	<2	Low--------	0.10			
	19	---	---	---	---	---	---	-----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
20--------------- Cerrillos	0-10	12-17	1.30-1.45	2.0-6.0	0.08-0.10	7.4-7.8	<2	Low--------	0.15	5	5	.5-1
	10-31	20-30	1.20-1.30	0.6-2.0	0.12-0.16	7.4-8.4	<2	Moderate	0.32			
	31-39	14-18	1.35-1.50	2.0-6.0	0.08-0.10	7.9-8.4	<2	Low--------	0.15			
	39-60	20-25	1.15-1.25	0.6-2.0	0.18-0.20	7.9-8.4	<2	Low--------	0.43			
21--------------- Chittum	0-4	10-20	1.20-1.30	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low--------	0.32	1	5	2-3
	4-10	18-35	1.30-1.50	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low--------	0.24			
	10	---	---	---	---	---	---	-----------	----			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
22 Coaldale	0-3	12-18	1.25-1.35	2.0-6.0	0.05-0.10	6.1-7.8	<2	Low	0.10	1	8	1-3
	3-10	20-30	1.25-1.35	0.6-2.0	0.06-0.11	6.6-7.8	<2	Low	0.05			
	10-18	12-18	1.30-1.40	2.0-6.0	0.05-0.10	7.4-8.4	<2	Low	0.05			
	18	---	---	---	---	---	---	---	---			
23 Cochetopa	0-5	27-32	1.25-1.35	0.2-0.6	0.17-0.20	6.6-7.8	<2	Low	0.28	5	5	2-4
	5-32	35-50	1.35-1.45	0.06-0.2	0.15-0.19	6.6-7.8	<2	High	0.28			
	32-60	20-32	1.30-1.40	0.2-2.0	0.17-0.20	6.6-7.8	<2	Low	0.32			
24 Corpening	0-4	10-20	1.15-1.25	0.6-2.0	0.09-0.11	7.4-8.4	<2	Low	0.15	1	8	2-3
	4-12	10-20	1.25-1.35	0.6-2.0	0.09-0.11	7.9-8.4	<2	Low	0.17			
	12	---	---	---	---	---	---	---	---			
25 Cryoborolls	0-3	15-23	1.15-1.25	0.6-2.0	0.09-0.14	6.6-7.3	<2	Low	0.15	5	7	2-4
	3-11	10-25	1.25-1.35	2.0-6.0	0.06-0.10	6.6-7.3	<2	Low	0.10			
	11-22	10-20	1.35-1.50	2.0-6.0	0.06-0.10	6.6-7.3	<2	Low	0.05			
	22-37	20-35	1.25-1.40	0.6-2.0	0.03-0.08	5.6-7.8	<2	Low	0.10			
	37-60	8-18	1.25-1.35	2.0-6.0	0.01-0.06	5.6-7.8	<2	Low	0.02			
26 Cumulic Cryaquolls	0-10	27-35	1.25-1.40	0.2-2.0	0.16-0.21	6.6-8.4	<2	Low	0.24	5	6	2-5
	10-25	20-35	1.15-1.40	0.2-2.0	0.14-0.21	6.6-8.4	<2	Moderate	0.24			
	25-60	10-35	1.15-1.40	0.6-2.0	0.10-0.21	6.6-8.4	<2	Low	0.20			
27 Curecanti	0-10	10-20	1.25-1.35	2.0-6.0	0.07-0.10	6.1-7.3	<2	Low	0.10	5	6	2-4
	10-28	18-35	1.35-1.45	0.6-2.0	0.07-0.12	6.1-7.3	<2	Low	0.10			
	28-60	5-17	1.40-1.50	2.0-6.0	0.03-0.07	6.6-7.8	<2	Low	0.05			
28 Curecanti	0-6	10-20	1.25-1.35	2.0-6.0	0.05-0.09	6.1-7.3	<2	Low	0.05	5	8	2-4
	6-20	18-35	1.35-1.45	0.6-2.0	0.07-0.12	6.1-7.3	<2	Low	0.10			
	20-60	5-17	1.40-1.50	2.0-6.0	0.03-0.07	6.6-7.8	<2	Low	0.05			
29 Curecanti Variant	0-8	18-27	1.20-1.35	0.6-2.0	0.05-0.08	6.1-7.3	<2	Low	0.05	3	8	2-4
	8-18	35-45	1.30-1.40	0.06-0.2	0.08-0.11	6.6-7.3	<2	High	0.10			
	18-50	24-35	1.30-1.40	0.2-0.6	0.08-0.12	7.9-8.4	<2	Moderate	0.15			
	50	---	---	---	---	---	---	---	---			
30 Dumps and Pits	0-60	---	---	---	---	---	<2	---	---	---	---	---
31 Ess	0-12	18-25	1.15-1.25	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	0.10	5	8	2-4
	12-40	20-35	1.25-1.40	0.2-2.0	0.07-0.12	6.6-7.8	<2	Moderate	0.10			
	40-60	12-17	1.35-1.50	2.0-6.0	0.04-0.09	7.4-7.8	<2	Low	0.05			
32 Ess	0-14	18-25	1.15-1.25	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	0.10	5	8	2-4
	14-33	20-35	1.25-1.40	0.2-2.0	0.07-0.12	6.6-7.8	<2	Moderate	0.10			
	33-40	20-35	1.40-1.55	0.2-2.0	0.04-0.09	6.6-7.8	<2	Moderate	0.10			
	40-60	12-17	1.45-1.55	2.0-6.0	0.03-0.07	7.4-7.8	<2	Low	0.05			
33:												
Ess	0-14	18-25	1.15-1.25	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	0.10	5	8	2-4
	14-33	20-35	1.25-1.40	0.2-2.0	0.07-0.12	6.6-7.8	<2	Moderate	0.10			
	33-40	20-35	1.40-1.55	0.2-0.6	0.04-0.09	6.6-7.8	<2	Moderate	0.10			
	40-60	12-17	1.45-1.55	2.0-6.0	0.03-0.07	7.4-7.8	<2	Low	0.05			
Bushvalley	0-4	15-25	1.20-1.30	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low	0.15	1	8	2-3
	4-11	20-35	1.40-1.50	0.2-0.6	0.06-0.09	6.1-7.8	<2	Low	0.05			
	11	---	---	---	---	---	---	---	---			
34, 35, 36 Fort Collins	0-4	12-20	1.35-1.40	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low	0.24	5	6	1-2
	4-21	18-35	1.45-1.55	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.24			
	21-60	12-27	1.45-1.55	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.24			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
37---------------- Fort Collins Variant	0-4	18-27	1.10-1.20	0.6-2.0	0.14-0.18	6.6-7.8	<2	Low--------	0.24	5	5	---
	4-13	25-35	1.30-1.40	0.2-0.6	0.16-0.20	6.6-7.8	<2	Moderate	0.24			
	13-60	15-27	1.40-1.50	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low--------	0.28			
38---------------- Granile	0-10	7-16	1.50-1.60	2.0-6.0	0.05-0.08	5.1-7.3	<2	Low--------	0.05	5	8	<1
	10-22	20-35	1.35-1.45	0.6-2.0	0.07-0.09	5.1-7.3	<2	Low--------	0.10			
	22-60	10-20	1.45-1.55	2.0-20	0.04-0.07	5.1-7.3	<2	Low--------	0.10			
39---------------- Granile	0-19	7-16	1.50-1.60	2.0-6.0	0.05-0.08	5.1-7.3	<2	Low--------	0.05	5	8	<1
	19-60	20-35	1.35-1.45	0.6-2.0	0.07-0.09	5.1-7.3	<2	Low--------	0.10			
40: Granile----------	0-10	7-16	1.50-1.60	2.0-6.0	0.05-0.08	5.1-7.3	<2	Low--------	0.05	5	8	<1
	10-22	20-35	1.35-1.45	0.6-2.0	0.07-0.09	5.1-7.3	<2	Low--------	0.10			
	22-60	10-20	1.45-1.55	2.0-20	0.04-0.07	5.1-7.3	<2	Low--------	0.10			
Guffey-----------	0-13	10-18	1.25-1.35	6.0-20	0.05-0.07	5.1-7.3	<2	Low--------	0.05	2	8	<1
	13-23	18-35	1.40-1.50	2.0-6.0	0.04-0.07	5.1-7.3	<2	Low--------	0.02			
	23-30	10-18	1.40-1.50	6.0-20	0.03-0.05	5.6-7.3	<2	Low--------	0.02			
	30	---	---	---	---	---	---	-----------	----			
41: Haploborolls-----	0-7	10-19	1.10-1.25	2.0-20	0.04-0.08	6.1-7.3	<2	Low--------	0.02	1	8	1-3
	7-12	10-19	1.10-1.25	2.0-20	0.04-0.08	6.1-8.4	<2	Low--------	0.02			
	12-21	---	---	---	---	---	---	-----------	----			
	21	---	---	---	---	---	---	-----------	----			
Rock outcrop-----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
42---------------- Heath	0-7	20-27	1.15-1.25	0.6-2.0	0.10-0.15	6.1-7.3	<2	Low--------	0.15	5	7	2-4
	7-32	36-60	1.35-1.45	<0.06	0.12-0.17	6.6-7.8	<2	High-------	0.24			
	32-60	40-60	1.45-1.55	<0.06	0.12-0.16	7.4-8.4	<2	High-------	0.32			
43: Herakle----------	0-7	18-27	1.20-1.30	0.6-2.0	0.07-0.11	6.6-7.8	<2	Low--------	0.10	1	8	<1
	7-13	27-35	1.30-1.40	0.6-2.0	0.09-0.12	6.6-7.8	<2	Moderate	0.10			
	13-17	18-30	1.25-1.35	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low--------	0.05			
	17	---	---	---	---	---	---	-----------	----			
Rock outcrop-----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
44---------------- Hodden	0-4	18-27	1.15-1.25	0.6-2.0	0.08-0.14	6.6-7.8	<2	Low--------	0.10	2	8	1-3
	4-16	20-35	1.25-1.40	0.6-2.0	0.09-0.14	6.6-7.8	<2	Low--------	0.10			
	16-44	12-20	1.50-1.65	2.0-6.0	0.02-0.05	7.9-8.4	<2	Low--------	0.02			
	44-60	8-15	1.50-1.70	6.0-20.0	0.01-0.04	7.9-8.4	<2	Low--------	0.02			
45---------------- Hoodle	0-10	10-20	1.25-1.30	0.6-2.0	0.13-0.18	6.1-7.3	<2	Low--------	0.24	2	5	2-4
	10-60	20-30	1.25-1.30	0.6-2.0	0.10-0.12	6.6-8.4	<2	Moderate	0.05			
46---------------- Jodero	0-10	12-18	1.30-1.45	2.0-6.0	0.11-0.13	7.4-7.8	<2	Low--------	0.15	5	5	2-5
	10-45	20-30	1.20-1.35	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low--------	0.24			
	45-60	6-12	1.50-1.60	6.0-20.0	0.03-0.04	6.6-7.3	<2	Low--------	0.05			
47---------------- Jodero Variant	0-12	27-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.32	5	6	2-4
	12-60	18-35	1.05-1.15	0.2-0.6	0.12-0.21	7.9-8.4	<2	Moderate	0.32			
48, 49------------ Kim	0-3	15-27	1.30-1.40	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.32	5	4L	.5-1
	3-60	20-35	1.40-1.50	0.6-2.0	0.15-0.17	7.9-8.4	<2	Low--------	0.32			
50---------------- Kim	0-3	15-20	1.30-1.40	0.6-2.0	0.15-0.18	7.4-8.4	<2	Low--------	0.32	5	4L	.5-1
	3-60	20-35	1.35-1.45	0.6-2.0	0.16-0.17	7.9-8.4	<2	Low--------	0.32			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
51---------------Kim	0-4	15-27	1.20-1.30	0.6-2.0	0.14-0.19	7.4-8.4	<2	Low-------	0.32	5	4L	.5-1
	4-60	18-35	1.25-1.35	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.32			
52:												
Kim-------------	0-4	15-27	1.30-1.40	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.32	5	4L	.5-1
	4-60	20-35	1.40-1.50	0.6-2.0	0.15-0.17	7.9-8.4	<2	Low-------	0.32			
Cascajo---------	0-6	8-17	1.25-1.35	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low-------	0.10	5	8	.5-1
	6-21	8-15	1.30-1.40	2.0-6.0	0.03-0.06	7.9-8.4	<2	Low-------	0.05			
	21-60	2-10	1.55-1.65	6.0-20	0.02-0.05	7.9-8.4	<2	Low-------	0.02			
53:												
Kim-------------	0-3	15-20	1.30-1.40	0.6-2.0	0.15-0.18	7.4-8.4	<2	Low-------	0.32	5	4L	.5-1
	3-60	18-30	1.35-1.45	0.6-2.0	0.13-0.17	7.9-8.4	<2	Low-------	0.32			
Shingle---------	0-4	18-27	1.25-1.35	0.6-2.0	0.15-0.18	7.4-8.4	<2	Low-------	0.32	1	4L	.5-1
	4-12	20-30	1.35-1.45	0.6-2.0	0.15-0.19	7.9-8.4	<2	Moderate	0.37			
	12	---	---	---	---	---	---	----------	----			
54:												
Lakehelen-------	0-5	12-18	1.30-1.40	2.0-6.0	0.06-0.08	6.1-7.3	<2	Low-------	0.10	2	8	<1
	5-15	10-20	1.35-1.40	2.0-6.0	0.02-0.06	6.1-7.3	<2	Low-------	0.05			
	15-23	18-35	1.35-1.40	0.6-2.0	0.04-0.07	6.1-7.3	<2	Low-------	0.02			
	23	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
55---------------Larand	0-15	12-18	1.30-1.45	2.0-6.0	0.06-0.08	5.6-7.3	<2	Low-------	0.10	5	8	<1
	15-22	25-35	1.45-1.55	0.6-2.0	0.06-0.09	5.6-7.3	<2	Moderate	0.15			
	22-28	20-27	1.35-1.50	0.6-2.0	0.04-0.06	5.6-7.3	<2	Moderate	0.05			
	28-60	5-10	1.25-1.35	6.0-20.0	0.02-0.03	5.6-7.3	<2	Low-------	0.05			
56---------------Larkson	0-3	10-25	1.20-1.30	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low-------	0.32	5	5	.5-1
	3-8	10-25	1.25-1.40	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low-------	0.28			
	8-40	35-45	1.35-1.50	0.06-0.2	0.15-0.17	6.1-7.8	<2	High------	0.24			
	40-60	20-30	1.30-1.40	0.2-0.6	0.17-0.20	6.1-7.8	<2	Moderate	0.32			
57---------------Libeg	0-7	12-19	1.35-1.50	2.0-6.0	0.02-0.05	6.6-7.3	<2	Low-------	0.05	5	8	2-4
	7-36	18-25	1.40-1.55	0.6-2.0	0.01-0.07	6.6-7.3	<2	Low-------	0.05			
	36-60	12-17	1.50-1.65	2.0-6.0	0.01-0.06	6.6-7.3	<2	Low-------	0.05			
58---------------Limon	0-3	30-40	1.35-1.40	0.2-0.6	0.14-0.17	7.4-8.4	2-8	High------	0.28	5	4L	.5-1
	3-60	35-60	1.35-1.45	0.06-0.2	0.12-0.16	7.9-8.4	2-8	High------	0.32			
59, 60-----------Limon	0-3	30-40	1.25-1.30	0.2-0.6	0.13-0.16	7.4-8.4	<8	Moderate	0.28	5	6	<1
	3-60	40-55	1.30-1.40	0.06-0.2	0.12-0.15	7.9-8.4	<8	Moderate	0.24			
61:												
Limon-----------	0-3	30-45	1.20-1.30	0.2-0.6	0.17-0.20	7.4-8.4	<4	High------	0.28	5	4L	.5-1
	3-46	35-60	1.35-1.45	0.06-0.2	0.14-0.18	7.9-8.4	<4	High------	0.32			
	46	---	---	---	---	---	---	----------	----			
Gaynor----------	0-4	30-40	1.25-1.35	0.2-0.6	0.15-0.17	7.4-8.4	<2	Moderate	0.37	2	4L	.5-1
	4-22	35-55	1.30-1.40	0.06-0.2	0.12-0.16	7.9-8.4	<8	High------	0.37			
	22	---	---	---	---	---	---	----------	----			
62:												
Limon-----------	0-3	30-45	1.20-1.30	0.2-0.6	0.17-0.20	7.4-8.4	<4	High------	0.28	5	4L	.5-1
	3-46	35-60	1.35-1.45	0.06-0.2	0.14-0.18	7.9-8.4	<4	High------	0.32			
	46	---	---	---	---	---	---	----------	----			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
62:												
Gaynor----------	0-4	30-40	1.25-1.35	0.2-0.6	0.15-0.17	7.4-8.4	<4	Moderate	0.28	2	4L	.5-1
	4-30	35-55	1.30-1.40	0.06-0.2	0.12-0.16	7.9-8.4	<8	High------	0.32			
	30	---	---	---	---	---	---	----------	----			
63:												
Limon-----------	0-3	30-40	1.25-1.30	0.2-0.6	0.13-0.16	7.4-8.4	<8	Moderate	0.28	5	6	.5-1
	3-60	40-55	1.30-1.40	0.06-0.2	0.12-0.15	7.9-8.4	<8	Moderate	0.24			
Gaynor----------	0-4	30-40	1.25-1.30	0.2-0.6	0.13-0.16	7.4-8.4	<8	Moderate	0.28	2	4L	.5-1
	4-30	35-55	1.30-1.40	0.06-0.2	0.12-0.15	7.9-8.4	<8	Moderate	0.24			
	30	---	---	---	---	---	---	----------	----			
64:												
Louviers--------	0-3	27-40	1.20-1.30	0.2-0.6	0.08-0.12	6.1-7.8	<2	Moderate	0.10	1	8	.5-1
	3-16	35-60	1.40-1.50	0.06-0.2	0.14-0.17	6.1-7.8	<2	High------	0.37			
	16	---	---	---	---	---	---	----------	----			
Travessilla-----	0-4	5-18	1.35-1.45	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low-------	0.20	1	6	.5-2
	4-14	10-18	1.35-1.45	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low-------	0.20			
	14	---	---	---	---	---	---	----------	----			
65, 66----------- Manvel	0-6	15-27	1.30-1.40	0.6-2.0	0.18-0.20	7.9-8.4	<2	Low-------	0.37	5	4L	.5-2
	6-60	18-35	1.35-1.40	0.2-2.0	0.16-0.18	7.9-8.4	2-4	Moderate	0.43			
67--------------- Manvel	0-30	27-35	1.30-1.40	0.6-2.0	0.10-0.16	7.9-8.4	>4	Moderate	0.28	5	4L	.5-1
	30-60	18-35	1.35-1.40	0.2-2.0	0.10-0.14	7.9-8.4	>8	Moderate	0.37			
68--------------- Manzanola	0-4	20-27	1.35-1.40	0.2-2.0	0.19-0.20	7.4-8.4	<4	Moderate	0.24	5	4L	.5-2
	4-17	35-45	1.30-1.40	0.06-0.2	0.15-0.18	7.9-8.4	<2	High------	0.28			
	17-60	30-40	1.30-1.40	0.2-0.6	0.16-0.18	7.9-8.4	<8	Moderate	0.24			
69--------------- Martinsdale	0-5	15-20	1.30-1.50	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low-------	0.24	5	3	2-4
	5-15	25-35	1.30-1.50	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.28			
	15-45	20-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	<2	Moderate	0.37			
	45-60	15-30	1.50-1.70	0.2-0.6	0.08-0.10	7.9-8.4	<2	Low-------	0.15			
70--------------- Martinsdale Variant	0-16	12-18	1.25-1.40	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low-------	0.10	5	3	2-4
	16-33	18-35	1.20-1.35	0.6-2.0	0.13-0.16	6.6-7.8	<2	Moderate	0.17			
	33-60	12-18	1.30-1.45	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low-------	0.20			
71--------------- Midway	0-3	30-40	1.25-1.35	0.2-0.6	0.14-0.18	7.4-8.4	2-4	Moderate	0.43	1	4L	.5-2
	3-16	35-55	1.20-1.35	0.06-0.2	0.14-0.18	7.9-8.4	2-8	High------	0.32			
	16	---	---	---	---	---	---	----------	----			
72:												
Midway----------	0-3	30-40	1.20-1.30	0.2-0.6	0.08-0.12	7.4-8.4	<2	Moderate	0.15	1	8	.5-1
	3-15	40-55	1.30-1.40	0.06-0.2	0.13-0.16	7.4-8.4	<2	High------	0.28			
	15	---	---	---	---	---	---	----------	----			
Cascajo---------	0-6	8-17	1.25-1.35	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low-------	0.10	5	8	.5-1
	6-21	8-15	1.30-1.40	2.0-6.0	0.03-0.06	7.9-8.4	<2	Low-------	0.05			
	21-60	2-10	1.55-1.65	6.0-20	0.02-0.05	7.9-8.4	<2	Low-------	0.02			
73--------------- Morset	0-8	15-27	1.20-1.25	0.6-2.0	0.15-0.19	6.6-7.8	<2	Low-------	0.24	5	5	1-3
	8-21	27-35	1.25-1.35	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	21-60	15-27	1.30-1.40	0.6-2.0	0.15-0.17	7.9-8.4	<2	Low-------	0.24			
74:												
Mussel----------	0-6	12-20	1.25-1.45	2.0-6.0	0.10-0.13	7.9-8.4	<2	Low-------	0.17	5	3	.5-2
	6-60	18-27	1.35-1.55	0.6-2.0	0.12-0.16	7.9-8.4	<2	Low-------	0.20			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
74:												
Bronell---------	0-16	10-18	1.25-1.35	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low--------	0.10	5	7	.5-2
	16-60	7-16	1.50-1.65	2.0-6.0	0.02-0.06	7.9-8.4	<2	Low--------	0.05			
75--------------- Neville	0-3	10-20	1.30-1.40	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low--------	0.20	5	3	.5-1
	3-60	18-35	1.30-1.40	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low--------	0.24			
76--------------- Nunn	0-4	20-27	1.20-1.30	0.6-2.0	0.13-0.16	6.6-7.8	<2	Low--------	0.17	5	8	1-3
	4-27	35-45	1.40-1.50	0.06-0.6	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	27-60	20-35	1.35-1.45	0.2-2.0	0.17-0.20	7.4-8.4	<2	Low--------	0.32			
77--------------- Nunn	0-4	20-35	1.20-1.30	0.6-2.0	0.17-0.20	6.6-7.8	<2	Low--------	0.28	5	5	1-3
	4-32	35-45	1.40-1.50	0.06-0.6	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	32-60	20-35	1.35-1.45	0.2-2.0	0.17-0.20	7.4-8.4	<2	Low--------	0.32			
78--------------- Nunn	0-10	27-35	1.20-1.30	0.2-0.6	0.17-0.20	6.6-7.8	<2	Moderate	0.32	5	6	1-3
	10-35	35-45	1.40-1.50	0.06-0.6	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	35-60	20-35	1.35-1.45	0.2-2.0	0.17-0.20	7.4-8.4	<2	Low--------	0.32			
79--------------- Nunn	0-4	27-35	1.20-1.30	0.2-0.6	0.17-0.20	6.6-7.8	<2	Moderate	0.32	5	6	1-3
	4-32	35-45	1.40-1.50	0.06-0.6	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	32-60	20-35	1.35-1.45	0.2-2.0	0.17-0.20	7.4-8.4	<2	Low--------	0.32			
80--------------- Otero	0-3	5-10	1.50-1.60	6.0-20.0	0.09-0.11	7.4-8.4	<2	Low--------	0.15	5	2	.5-1
	3-60	5-15	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.20			
81--------------- Otero	0-2	5-15	1.40-1.50	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.20	5	3	.5-2
	2-60	5-15	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.20			
82--------------- Pendant	0-4	10-25	1.20-1.30	0.6-2.0	0.06-0.08	7.4-8.4	<2	Low--------	0.05	1	8	1-3
	4-11	10-25	1.25-1.35	0.6-2.0	0.06-0.08	7.4-8.4	<2	Low--------	0.05			
	11	---	---	---	---	---	---	----------	----			
83:												
Penrose---------	0-15	15-27	1.35-1.45	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.17	1	8	.5-1
	15	---	---	---	---	---	---	----------	----			
Minnequa--------	0-2	15-27	1.30-1.40	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.32	2	4L	.5-2
	2-28	18-35	1.35-1.40	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37			
	28	---	---	---	---	---	---	----------	----			
84:												
Penrose---------	0-15	15-27	1.35-1.45	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.17	1	8	.5-1
	15	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
85--------------- Querida	0-11	8-17	1.30-1.45	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low--------	0.10	5	6	.5-2
	11-60	8-17	1.45-1.60	2.0-6.0	0.10-0.13	7.9-8.4	<2	Low--------	0.10			
86:												
Raleigh---------	0-2	8-18	1.50-1.60	6.0-20	0.04-0.06	6.1-7.3	<2	Low--------	0.10	1	8	2-4
	2-18	5-15	1.50-1.60	6.0-20	0.03-0.05	6.1-7.3	<2	Low--------	0.10			
	18	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
87:												
Redcameron------	0-2	10-25	1.20-1.30	0.6-2.0	0.10-0.15	7.4-8.4	<2	Low--------	0.17	1	4L	<1
	2-12	10-25	1.50-1.60	0.6-2.0	0.08-0.13	7.9-8.4	<2	Low--------	0.15			
	12	---	---	---	---	---	---	----------	----			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
87:												
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
Teaspoon--------	0-3	13-18	1.25-1.35	2.0-6.0	0.05-0.08	6.1-7.8	<2	Low-------	0.02	1	8	2-4
	3-8	18-30	1.30-1.40	0.6-2.0	0.06-0.11	6.1-7.8	<2	Low-------	0.02			
	8	---	---	---	---	---	---	----------	----			
88--------------- Rentsac	0-3	7-18	1.30-1.40	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low-------	0.10	1	8	.5-2
	3-10	7-18	1.40-1.55	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low-------	0.10			
	10	---	---	---	---	---	---	----------	----			
89--------------- Rentsac Variant	0-7	15-27	1.20-1.30	0.6-2.0	0.10-0.14	7.9-8.4	<2	Low-------	0.17	1	6	1-3
	7-19	18-27	1.25-1.35	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low-------	0.10			
	19	---	---	---	---	---	---	----------	----			
90--------------- Resort	0-12	5-15	1.30-1.40	6.0-20	0.04-0.06	6.1-7.3	<2	Low-------	0.10	1	8	2-4
	12-17	0-10	1.60-1.70	6.0-20	0.03-0.05	6.1-7.3	<2	Low-------	0.10			
	17	---	---	---	---	---	---	----------	----			
91:												
Resort----------	0-12	5-15	1.30-1.40	6.0-20	0.04-0.06	6.1-7.3	<2	Low-------	0.10	1	8	2-4
	12-17	0-10	1.60-1.70	6.0-20	0.03-0.05	6.1-7.3	<2	Low-------	0.10			
	17	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
92--------------- Riverwash	0-6	0-1	---	>6.0	0.02-0.03	---	<2	Low-------	----	---	8	<.1
	6-60	0-1	---	>6.0	0.02-0.03	---	<2	Low-------	----			
93:												
Rizozo----------	0-3	15-25	1.25-1.35	0.6-2.0	0.10-0.14	7.4-8.4	<2	Low-------	0.20	1	5	<1
	3-13	18-27	1.30-1.40	0.6-2.0	0.13-0.16	7.4-8.4	<2	Low-------	0.37			
	13	---	---	---	---	---	---	----------	----			
Neville---------	0-3	10-20	1.30-1.40	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low-------	0.20	5	3	.5-1
	3-60	18-35	1.30-1.40	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low-------	0.24			
94:												
Rizozo----------	0-3	15-25	1.25-1.35	0.6-2.0	0.10-0.14	7.4-8.4	<2	Low-------	0.20	1	5	<1
	3-13	18-27	1.30-1.40	0.6-2.0	0.13-0.16	7.4-8.4	<2	Low-------	0.37			
	13	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
95--------------- Rock outcrop	0-60	---	---	---	---	---	---	----------	----	---	---	---
96, 97----------- Rogert	0-5	10-18	1.35-1.45	2.0-6.0	0.04-0.08	6.1-7.3	<2	Low-------	0.05	1	8	2-4
	5-17	10-18	1.40-1.50	2.0-6.0	0.04-0.08	6.1-7.3	<2	Low-------	0.05			
	17	---	---	---	---	---	---	----------	----			
98--------------- Roygorge	0-2	18-25	1.15-1.25	0.6-2.0	0.04-0.09	6.1-7.8	<2	Moderate	0.10	1	8	.5-2
	2-12	20-30	1.30-1.40	0.6-2.0	0.04-0.09	6.1-7.8	<2	Moderate	0.10			
	12	---	---	---	---	---	---	----------	----			
99--------------- Sawfork	0-8	18-25	1.15-1.25	0.6-2.0	0.07-0.12	6.6-7.8	<2	Low-------	0.10	2	8	1-3
	8-14	20-35	1.25-1.40	0.6-2.0	0.07-0.12	6.6-7.8	<2	Low-------	0.10			
	14-48	16-24	1.40-1.55	0.6-2.0	0.10-0.16	7.4-8.4	<2	Low-------	0.32			
	48	---	---	---	---	---	---	----------	----			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
100-------------- Sedillo	0-5	10-20	1.30-1.40	2.0-6.0	0.08-0.10	6.6-7.8	<2	Low--------	0.15	5	7	.5-1
	5-9	20-35	1.20-1.35	0.6-2.0	0.07-0.10	6.6-8.4	<2	Moderate	0.10			
	9-60	10-20	1.35-1.45	2.0-6.0	0.05-0.07	7.9-8.4	<2	Low--------	0.10			
101-------------- Sedillo	0-3	15-25	1.20-1.30	0.6-2.0	0.07-0.10	6.6-7.8	<2	Low--------	0.10	5	7	.5-1
	3-20	20-35	1.20-1.35	0.6-2.0	0.07-0.10	6.6-8.4	<2	Moderate	0.10			
	20-60	10-20	1.35-1.45	2.0-6.0	0.05-0.07	7.9-8.4	<2	Low--------	0.10			
102-------------- Seitz	0-15	10-20	1.45-1.50	2.0-6.0	0.09-0.12	6.1-7.3	<2	Low--------	0.10	5	6	.5-1
	15-34	35-55	1.30-1.40	0.06-0.2	0.07-0.12	6.1-7.3	<2	Moderate	0.10			
	34-60	27-40	1.30-1.40	0.2-0.6	0.07-0.11	6.1-7.3	<2	Moderate	0.10			
103:												
Seitz-----------	0-8	15-27	1.40-1.45	2.0-6.0	0.05-0.09	6.1-7.3	<2	Low--------	0.10	5	8	.5-1
	8-60	35-55	1.30-1.40	0.06-0.2	0.07-0.12	6.1-7.3	<2	Moderate	0.10			
Bushvalley------	0-4	15-25	1.20-1.30	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low--------	0.15	1	8	2-3
	4-11	20-35	1.40-1.50	0.2-0.6	0.06-0.09	6.1-7.8	<2	Low--------	0.05			
	11	---	---	---	---	---	---	-----------	----			
104-------------- Shanta	0-49	15-25	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	<2	Moderate	0.24	4	5	1-3
	49-60	10-25	1.40-1.50	0.6-6.0	0.10-0.15	7.4-8.4	<2	Low	0.20			
105-------------- Shanta	0-27	15-25	1.30-1.40	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.24	4	5	1-3
	27-60	18-35	1.40-1.50	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.37			
106:												
Shanta----------	0-12	15-25	1.20-1.30	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.24	4	5	1-3
	12-60	18-35	1.40-1.50	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.37			
Nederland-------	0-8	10-19	1.30-1.40	2.0-6.0	0.05-0.08	6.6-7.8	<2	Low--------	0.02	5	8	2-4
	8-31	20-35	1.35-1.45	0.6-2.0	0.05-0.09	6.6-7.8	<2	Moderate	0.05			
	31-60	8-16	1.35-1.45	2.0-6.0	0.04-0.07	6.6-7.8	<2	Low--------	0.02			
107-------------- Shingle	0-4	10-18	1.35-1.45	2.0-6.0	0.05-0.09	7.4-8.4	<2	Low--------	0.02	1	8	.5-2
	4-17	20-30	1.35-1.45	0.6-2.0	0.15-0.19	7.9-8.4	<2	Moderate	0.37			
	17	---	---	---	---	---	---	-----------	----			
108-------------- Shingle	0-6	18-27	1.10-1.20	0.6-2.0	0.17-0.20	7.4-8.4	<2	Low--------	0.32	1	4L	.5-1
	6-13	20-35	1.20-1.30	0.6-2.0	0.17-0.20	7.9-8.4	<2	Moderate	0.49			
	13	---	---	---	---	---	---	-----------	----			
109-------------- Shrine	0-10	15-27	1.25-1.35	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.28	5	5	2-4
	10-60	18-35	1.35-1.45	0.6-2.0	0.14-0.16	7.9-8.4	<2	Moderate	0.32			
110:												
Swissvale-------	0-2	10-18	1.25-1.35	2.0-6.0	0.05-0.08	6.6-7.8	<2	Low--------	0.05	1	8	.5-1
	2-5	18-25	1.25-1.40	2.0-6.0	0.07-0.10	6.6-7.8	<2	Low--------	0.05			
	5-9	18-35	1.30-1.40	0.6-2.0	0.07-0.10	6.6-7.8	<2	Low--------	0.10			
	9-19	---	---	---	---	---	---	-----------	----			
	19	---	---	---	---	---	---	-----------	----			
Rentsac---------	0-3	7-18	1.25-1.45	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low--------	0.10	1	8	.5-2
	3-8	7-18	1.30-1.55	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low--------	0.10			
	8	---	---	---	---	---	---	-----------	----			
111-------------- Teaspoon	0-4	13-18	1.25-1.35	2.0-6.0	0.05-0.08	6.1-7.8	<2	Low--------	0.05	1	8	2-4
	4-11	20-30	1.30-1.40	0.6-2.0	0.06-0.11	6.1-7.8	<2	Low--------	0.02			
	11	---	---	---	---	---	---	-----------	----			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
112---------------- Tecolote	0-3	10-18	1.35-1.40	2.0-6.0	0.05-0.07	6.6-7.3	<2	Low--------	0.05	5	8	1-2
	3-9	10-16	1.45-1.55	2.0-6.0	0.04-0.07	6.6-7.3	<2	Low--------	0.05			
	9-41	18-35	1.35-1.40	0.6-2.0	0.06-0.08	6.6-7.8	<2	Moderate	0.05			
	41-60	10-20	1.50-1.60	2.0-6.0	0.04-0.07	6.6-7.8	<2	Low--------	0.02			
113---------------- Tecolote	0-15	10-20	1.30-1.40	2.0-6.0	0.04-0.07	6.6-7.8	<2	Low--------	0.05	5	8	1-2
	15-41	18-35	1.35-1.40	0.6-2.0	0.06-0.08	6.6-7.8	<2	Moderate	0.05			
	41-60	10-20	1.45-1.50	2.0-6.0	0.04-0.07	6.6-7.8	<2	Low--------	0.02			
114---------------- Tellura	0-13	27-35	1.20-1.30	0.2-0.6	0.11-0.16	6.1-7.3	<2	Low--------	0.17	3	6	2-4
	13-48	35-50	1.35-1.45	0.06-0.2	0.06-0.10	6.1-7.3	<2	Moderate	0.15			
	48-60	20-30	1.45-1.55	0.6-2.0	0.04-0.09	6.6-7.8	<2	Low--------	0.05			
115---------------- Tolex	0-2	12-20	1.35-1.45	2.0-6.0	0.05-0.09	6.1-7.3	<2	Low--------	0.10	1	8	1-3
	2-7	12-20	1.35-1.50	2.0-6.0	0.03-0.07	6.1-7.3	<2	Low--------	0.05			
	7-17	20-30	1.40-1.50	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low--------	0.05			
	17	---	---	---	---	---	---	-----------	----			
116: Tolex------------	0-5	12-20	1.35-1.45	2.0-6.0	0.05-0.09	6.1-7.3	<2	Low--------	0.10	1	8	1-3
	5-12	12-20	1.35-1.50	2.0-6.0	0.03-0.07	6.1-7.3	<2	Low--------	0.05			
	12-19	20-30	1.40-1.50	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low--------	0.05			
	19	---	---	---	---	---	---	-----------	----			
Larkson----------	0-4	10-25	1.20-1.30	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low--------	0.32	5	5	.5-1
	4-8	10-25	1.25-1.40	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low--------	0.28			
	8-40	35-45	1.35-1.50	0.06-0.2	0.15-0.17	6.1-7.8	<2	High-------	0.24			
	40-60	20-30	1.30-1.40	0.2-0.6	0.17-0.20	6.1-7.8	<2	Moderate	0.32			
117---------------- Travessilla	0-4	5-18	1.35-1.45	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.20	1	5	.5-2
	4-14	10-18	1.35-1.45	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.20			
	14	---	---	---	---	---	---	-----------	----			
118: Travessilla------	0-4	12-18	1.45-1.55	2.0-6.0	0.07-0.10	6.6-8.4	<2	Low--------	0.10	1	6	.5-2
	4-9	15-18	1.45-1.55	2.0-6.0	0.08-0.17	6.6-8.4	<2	Low--------	0.32			
	9	---	---	---	---	---	---	-----------	----			
Rock outcrop-----	0-60	---	---	---	---	---	---	-----------	----	---	---	---
119: Troutdale--------	0-7	18-27	1.20-1.30	0.6-2.0	0.16-0.19	6.1-7.3	<2	Low--------	0.28	2	5	2-4
	7-22	20-35	1.35-1.45	0.6-2.0	0.14-0.17	6.6-7.8	<2	Low--------	0.28			
	22	---	---	---	---	---	---	-----------	----			
Rogert------------	0-5	10-18	1.35-1.45	2.0-6.0	0.04-0.08	6.1-7.3	<2	Low--------	0.05	1	8	2-4
	5-17	10-18	1.40-1.50	2.0-6.0	0.04-0.08	6.1-7.3	<2	Low--------	0.05			
	17	---	---	---	---	---	---	-----------	----			
120: Ustic Torriorthents--	0-4	8-18	1.25-1.35	2.0-6.0	0.02-0.06	6.1-7.8	<2	Low--------	0.02	1	8	.5-2
	4-7	8-18	1.40-1.50	2.0-6.0	0.02-0.06	6.1-8.4	<2	Low--------	0.02			
	7-18	---	---	---	---	---	---	-----------	----			
	18	---	---	---	---	---	---	-----------	----			
Rock outcrop-----	0-60	---	---	---	---	---	---	-----------	----	---	---	---

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
121:												
Ustic												
Torriorthents--	0-2	15-27	1.20-1.30	2.0-6.0	0.08-0.11	6.6-7.3	<2	Low-------	0.10	3	8	.5-1
	2-27	27-35	1.25-1.35	0.06-0.6	0.11-0.16	7.4-8.4	<2	Moderate	0.10			
	27-42	15-27	1.40-1.45	0.06-2.0	0.09-0.16	7.4-8.4	<2	Low-------	0.15			
	42	---	---	---	---	---	---	----------	----			
Sedillo---------	0-4	15-25	1.20-1.30	0.6-2.0	0.04-0.08	6.6-7.8	<2	Low-------	0.05	5	8	1-3
	4-10	20-30	1.35-1.45	0.6-2.0	0.03-0.07	6.6-8.4	<2	Low-------	0.05			
	10-35	15-25	1.30-1.40	0.6-2.0	0.03-0.07	7.9-8.4	<2	Low-------	0.05			
	35-60	15-27	1.30-1.40	0.6-2.0	0.14-0.18	7.4-8.4	<2	Low-------	0.37			
122--------------	0-5	15-27	1.30-1.40	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.24	5	5	2-4
Wages	5-21	20-35	1.35-1.45	0.6-2.0	0.14-0.21	6.6-7.8	<2	Moderate	0.24			
	21-60	15-35	1.35-1.45	0.6-2.0	0.11-0.18	7.9-8.4	<2	Low-------	0.24			
123:												
Wahatoya--------	0-2	8-16	1.30-1.40	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low-------	0.05	2	8	1-3
	2-10	8-16	1.35-1.45	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low-------	0.05			
	10-38	18-35	1.40-1.50	0.6-2.0	0.02-0.05	5.6-7.3	<2	Low-------	0.02			
	38	---	---	---	---	---	---	----------	----			
Tolex-----------	0-5	12-20	1.35-1.45	2.0-6.0	0.05-0.09	6.1-7.3	<2	Low-------	0.10	1	8	1-3
	5-12	12-20	1.35-1.50	2.0-6.0	0.03-0.07	6.1-7.3	<2	Low-------	0.05			
	12-19	20-30	1.40-1.50	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low-------	0.05			
	19	---	---	---	---	---	---	----------	----			
124:												
Wann------------	0-12	8-17	1.35-1.45	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low-------	0.17	4	3	1-3
	12-48	8-17	1.30-1.40	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low-------	0.24			
	48-60	5-12	1.40-1.55	2.0-20	0.03-0.05	7.4-8.4	<2	Low-------	0.02			
Shanta----------	0-27	15-25	1.30-1.40	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.24	4	5	1-3
	27-60	18-35	1.40-1.50	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.37			
125--------------	0-3	15-25	1.15-1.25	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low-------	0.17	1	8	.5-2
Wesix	3-13	15-25	1.25-1.35	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low-------	0.17			
	13	---	---	---	---	---	---	----------	----			
126:												
Wetmore---------	0-3	5-10	1.55-1.65	6.0-20	0.05-0.07	5.6-7.3	<2	Low-------	0.10	1	8	.5-1
	3-10	10-20	1.55-1.65	6.0-20	0.07-0.09	5.6-7.3	<2	Low-------	0.10			
	10	---	---	---	---	---	---	----------	----			
Bundo-----------	0-8	10-20	1.25-1.35	2.0-6.0	0.04-0.07	6.1-7.3	<2	Low-------	0.05	3	8	.5-1
	8-26	10-20	1.35-1.45	6.0-20	0.03-0.07	6.1-7.3	<2	Low-------	0.05			
	26-45	18-30	1.40-1.50	0.6-2.0	0.04-0.08	6.1-7.3	<2	Low-------	0.05			
	45-60	10-25	1.50-1.65	6.0-20	0.03-0.05	6.1-7.3	<2	Low-------	0.05			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
127:												
Wetmore---------	0-3	5-10	1.55-1.65	6.0-20	0.05-0.07	5.6-7.3	<2	Low-------	0.10	1	8	.5-1
	3-10	10-20	1.55-1.65	6.0-20	0.07-0.09	5.6-7.3	<2	Low-------	0.10			
	10	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	---	----------	----	---	---	---
128--------------	0-4	15-27	1.25-1.35	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low-------	0.37	5	4L	.5-1
Wiley	4-21	18-35	1.30-1.40	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	0.32			
	21-60	18-35	1.30-1.40	0.6-2.0	0.16-0.21	7.9-8.4	<2	Moderate	0.37			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
129-------------- Wiley	0-5	15-27	1.25-1.35	0.6-2.0	0.19-0.21	6.6-8.4	<2	Low--------	0.37	5	4L	.5-1
	5-27	18-35	1.30-1.40	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	0.32			
	27-60	18-35	1.30-1.40	0.6-2.0	0.16-0.21	7.9-8.4	<2	Moderate	0.37			
130-------------- Youga	0-12	12-17	1.25-1.35	2.0-6.0	0.09-0.13	6.1-7.3	<2	Low--------	0.15	5	3	1-4
	12-42	20-35	1.25-1.40	0.2-0.6	0.10-0.16	6.6-7.8	<2	Low--------	0.10			
	42-60	12-17	1.50-1.65	2.0-6.0	0.05-0.10	6.6-7.8	<2	Low--------	0.05			

TABLE 16.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1: Adderton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
2: Amalia	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
3: Aquic Ustifluvents	C	Occasional	Brief	Apr-Jun	1.0-4.0	Apparent	May-Jun	>60	---	High	High	Moderate.
4: Aquolls	D	Frequent	Brief	Apr-Jun	0-2.0	Apparent	Apr-Aug	>60	---	High	High	Low.
5: Arents	B	None	---	---	>6.0	---	---	>60	---	Low	High	High.
6: Bloom	D	Occasional	Very brief	Apr-Jun	0.5-2.0	Apparent	May-Aug	>60	---	High	High	Moderate.
7: Boyle	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
8:												
Boyle	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
Martinsdale	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
9:												
Boyle	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
10: Bronell	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
11:												
Bronell	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Kerhayden	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
12:												
Bronell Variant	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
12:												
Wesix	D	None	---	---	>6.0	---	---	7-20	Hard	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
13 Bundo	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
14 Bushvalley	D	None	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Low.
15:												
Bushvalley	D	None	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Low.
Whiteman	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
16 Cascajo	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
17 Cascajo Variant	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
18:												
Casvare	D	None	---	---	>6.0	---	---	6-20	Soft	Low	Moderate	Low.
Teaspoon	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
19:												
Cathedral	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
20 Cerrillos	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
21 Chittum	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
22 Coaldale	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
23 Cochetopa	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
24 Corpening	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
25------ Cryoborolls	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
26------ Cumulic Cryaquolls	D	Occasional	Brief-----	Apr-Jul	0-1.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
27, 28------ Curecanti	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
29------ Curecanti Variant	B	None----	---	---	>6.0	---	---	40-70	Hard	Low------	Moderate	Low.
30------ Dumps and Pits	-	None----	---	---	>6.0	---	---	>60	---	---	---	---
31, 32------ Ess	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
33:												
Ess------	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bushvalley------	D	None----	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Low.
34, 35, 36------ Fort Collins	B	None----	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
37------ Fort Collins Variant	B	None----	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
38, 39------ Granile	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
40:												
Granile------	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Guffey------	C	None----	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Moderate.
41:												
Haploborolls------	D	None----	---	---	>6.0	---	---	4-40	Hard	Moderate	Moderate	Low.
Rock outcrop------	D	None----	---	---	>6.0	---	---	0	Hard	---	---	---
42------ Heath	D	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
43:												
Herakle	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
44 Hodden	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
45 Hoodle	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
46 Jodero	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
47 Jodero Variant	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
48, 49, 50 Kim	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
51 Kim	C	None	---	---	2.0-6.0	Apparent	May-Sep	>60	---	Low	Moderate	Low.
52:												
Kim	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Cascajo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
53:												
Kim	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Shingle	D	None	---	---	>6.0	---	---	4-20	Soft	Low	Moderate	Low.
54:												
Lakehelen	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
55 Larand	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
56 Larkson	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
57 Libeg	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
58: Limon	C	Rare	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
59: Limon	D	None	---	---	2.5-4.0	Apparent	May-Sep	>60	---	Low	High	Moderate.
60: Limon	D	Rare	---	---	2.5-4.0	Apparent	May-Sep	>60	---	Low	High	Moderate.
61, 62:												
Limon	C	None	---	---	>6.0	---	---	40-60	Soft	Low	High	Moderate.
Gaynor	C	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
63:												
Limon	D	None	---	---	2.5-4.0	Perched	May-Sep	>60	---	Low	High	Moderate.
Gaynor	D	None	---	---	1.5-4.0	Perched	May-Sep	20-40	Soft	Low	High	Moderate.
64:												
Louviers	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
Travessilla	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Moderate	Low.
65, 66: Manvel	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
67: Manvel	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
68: Manzanola	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
69: Martinsdale	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
70: Martinsdale Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
71: Midway	D	None	---	---	>6.0	---	---	6-20	Soft	Low	High	Moderate.
72:												
Midway	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
Cascajo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
73-----Morset	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
74:												
Mussel-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Bronell-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
75-----Neville	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
76, 77, 78, 79-----Nunn	C	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
80, 81-----Otero	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
82-----Pendant	D	None-----	---	---	>6.0	---	---	7-20	Hard	Low-----	Moderate	Low.
83:												
Penrose-----	D	None-----	---	---	>6.0	---	---	10-20	Hard	Low-----	Moderate	Low.
Minnequa-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	Moderate	Low.
84:												
Penrose-----	D	None-----	---	---	>6.0	---	---	10-20	Hard	Low-----	Moderate	Low.
Rock outcrop-----	D	None-----	---	---	>6.0	---	---	0	Hard	---	---	---
85-----Querida	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
86:												
Raleigh-----	D	None-----	---	---	>6.0	---	---	10-20	Soft	Low-----	Moderate	Low.
Rock outcrop-----	D	None-----	---	---	>6.0	---	---	0	Hard	---	---	---
87:												
Redcameron-----	D	None-----	---	---	>6.0	---	---	4-20	Hard	Low-----	Moderate	Low.
Rock outcrop-----	D	None-----	---	---	>6.0	---	---	0	Hard	---	---	---
Teaspoon-----	D	None-----	---	---	>6.0	---	---	8-20	Hard	Low-----	Moderate	Low.
88-----Rentsac	D	None-----	---	---	>6.0	---	---	4-20	Hard	Low-----	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
89: Rentsac Variant	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
90: Resort	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
91:												
Resort	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
92: Riverwash	D	Frequent	Long or very long.	Oct-Jul	0-2.0	Apparent	Jan-Dec	>60	---	---	---	---
93:												
Rizozo	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Moderate	Low.
Neville	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
94:												
Rizozo	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
95: Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
96, 97: Rogert	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
98: Roygorge	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
99: Sawfork	B	None	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	Low.
100, 101: Sedillo	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
102: Seitz	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
103:												
Seitz	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bushvalley	D	None	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
104, 105 Shanta	B	Rare	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
106:												
Shanta	B	Rare	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Nederland	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
107 Shingle	D	None	---	---	>6.0	---	---	4-20	Soft	Low	Moderate	Low.
108 Shingle	D	None	---	---	>6.0	---	---	4-20	Soft	Low	Moderate	Low.
109 Shrine	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
110:												
Swissvale	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
Rentsac	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Moderate	Low.
111 Teaspoon	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
112, 113 Tecolote	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
114 Tellura	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
115 Tolex	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
116:												
Tolex	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
Larkson	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
117 Travessilla	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Moderate	Low.
118:												
Travessilla	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
119:												
Troutdale	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
Rogert	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
120:												
Ustic Torriorthents	D	None	---	---	>6.0	---	---	4-30	Soft	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
121:												
Ustic Torriorthents	B	None	---	---	>6.0	---	---	15-60	Soft	Low	Moderate	Low.
Sedillo	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
122 Wages	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
123:												
Wahatoya	C	None	---	---	>6.0	---	---	20-40	Hard	Low	Moderate	Low.
Tolex	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate	Low.
124:												
Wann	C	Occasional	Brief	May-Jun	1.0-3.0	Apparent	Apr-Jun	>60	---	Low	Moderate	Low.
Shanta	B	Rare	---	---	>4.0	---	---	>60	---	Low	High	Low.
125 Wesix	D	None	---	---	>6.0	---	---	7-20	Hard	Low	Moderate	Low.
126:												
Wetmore	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
Bundo	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
127:												
Wetmore	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
128, 129 Wiley	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
130--------------- Youga	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adderton	Fine-loamy, mixed Cumulic Cryoborolls
Amalia	Loamy-skeletal, mixed Borollic Haplargids
Aquic Ustifluvents	Aquic Ustifluvents
Aquolls	Aquolls
Arents	Arents
Bloom	Fine-silty, mixed (calcareous), mesic Aeric Fluvaquents
Boyle	Loamy-skeletal, mixed, shallow Aridic Argiborolls
Bronell	Loamy-skeletal, mixed Borollic Calciorthids
Bronell Variant	Loamy-skeletal, mixed, mesic Ustollic Calciorthids
Bundo	Loamy-skeletal, mixed Typic Paleboralfs
Bushvalley	Loamy-skeletal, mixed Argic Lithic Cryoborolls
Cascajo	Sandy-skeletal, mixed, mesic Ustollic Calciorthids
Cascajo Variant	Sandy-skeletal, mixed Cumulic Haploborolls
Casvare	Loamy-skeletal, mixed, shallow Typic Haploborolls
Cathedral	Loamy-skeletal, mixed Lithic Haploborolls
Cerrillos	Fine-loamy, mixed, mesic Ustollic Haplargids
Chittum	Loamy, mixed Argic Lithic Cryoborolls
Coaldale	Loamy-skeletal, mixed Borollic Lithic Haplargids
Cochetopa	Fine, montmorillonitic Argic Pachic Cryoborolls
Corpening	Loamy, mixed Lithic Haploborolls
Cryoborolls	Cryoborolls
Cumulic Cryaquolls	Cumulic Cryaquolls
Curecanti	Loamy-skeletal, mixed Typic Argiborolls
Curecanti Variant	Clayey-skeletal, montmorillonitic, mesic Aridic Argiustolls
Ess	Loamy-skeletal, mixed Argic Cryoborolls
Fort Collins	Fine-loamy, mixed, mesic Ustollic Haplargids
Fort Collins Variant	Fine-loamy, mixed Borollic Haplargids
Gaynor	Fine, montmorillonitic (calcareous), mesic Ustic Torriorthents
Granile	Loamy-skeletal, mixed Typic Cryoboralfs
Guffey	Loamy-skeletal, mixed Typic Cryoboralfs
Haploborolls	Haploborolls
Heath	Fine, montmorillonitic Argic Cryoborolls
Herakle	Loamy-skeletal, mixed Lithic Cryoboralfs
Hodden	Loamy-skeletal, mixed Argic Cryoborolls
Hoodle	Loamy-skeletal, mixed Argic Cryoborolls
Jodero	Fine-loamy, mixed Cumulic Haploborolls
Jodero Variant	Fine-silty, mixed Cumulic Cryoborolls
Kerhayden	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Kim	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Lakehelen	Loamy-skeletal, mixed Typic Cryoboralfs
Larand	Loamy-skeletal, mixed Typic Cryoboralfs
Larkson	Fine, montmorillonitic Typic Eutroboralfs
Libeg	Loamy-skeletal, mixed Argic Cryoborolls
Limon	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Louviers	Clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents
Manvel	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Manzanola	Fine, montmorillonitic, mesic Ustollic Haplargids
Martinsdale	Fine-loamy, mixed Typic Argiborolls
Martinsdale Variant	Fine-loamy, mixed Pachic Argiborolls
Midway	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Minnequa	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Morset	Fine-loamy, mixed Argic Cryoborolls
Mussel	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Nederland	Loamy-skeletal, mixed, mesic Aridic Argiustolls
Neville	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Nunn	Fine, montmorillonitic, mesic Aridic Argiustolls
Otero	Coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents
Pendant	Loamy-skeletal, mixed Lithic Haploborolls
Penrose	Loamy, carbonatic, mesic Lithic Ustic Torriorthents
Querida	Coarse-loamy, mixed (calcareous), frigid Ustic Torriorthents
Raleigh	Loamy-skeletal, mixed, shallow Typic Cryoborolls
Redcameron	Loamy, mixed (calcareous), frigid Lithic Ustic Torriorthents
Rentsac	Loamy-skeletal, mixed (calcareous), frigid Lithic Ustic Torriorthents

TABLE 17.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Rentsac Variant	Loamy-skeletal, mixed Lithic Cryoborolls
Resort	Sandy-skeletal, mixed, shallow Entic Haploborolls
Rizozo	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Rogert	Loamy-skeletal, mixed Lithic Cryoborolls
Roygorge	Loamy-skeletal, mixed, mesic Lithic Ustollic Haplargids
Sawfork	Loamy-skeletal, mixed Argic Cryoborolls
Sedillo	Loamy-skeletal, mixed, mesic Ustollic Haplargids
Seitz	Clayey-skeletal, montmorillonitic Typic Cryoboralfs
Shanta	Fine-loamy, mixed, mesic Cumulic Haplustolls
Shingle	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Shrine	Fine-loamy, mixed Torriorthentic Haploborolls
Swissvale	Loamy-skeletal, mixed Borollic Lithic Haplargids
Teaspoon	Loamy-skeletal, mixed Lithic Argiborolls
Tecolote	Loamy-skeletal, mixed Typic Eutroboralfs
Tellura	Clayey-skeletal, montmorillonitic Argic Cryoborolls
Tolex	Loamy-skeletal, mixed Lithic Eutroboralfs
Travessilla	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Troutdale	Fine-loamy, mixed Argic Cryoborolls
Ustic Torriorthents	Ustic Torriorthents
Wages	Fine-loamy, mixed, mesic Aridic Argiustolls
Wahatoya	Loamy-skeletal, mixed Typic Eutroboralfs
Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Wesix	Loamy-skeletal, carbonatic, mesic Lithic Ustic Torriorthents
Wetmore	Loamy-skeletal, mixed Lithic Eutroboralfs
Whiteman	Loamy-skeletal, mixed Lithic Mollic Cryoboralfs
Wiley	Fine-silty, mixed, mesic Ustollic Haplargids
Youga	Fine-loamy, mixed Argic Cryoborolls

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